

*August 2012*

## NIEHS Spotlight



### [NIEHS hosts French delegation](#)

NIEHS leadership welcomed representatives of the French national health and medical research institute Inserm June 27 and heard a presentation by them.



### [HHS/NIEHS meeting advances environmental justice initiatives](#)

Nearly 100 attendees gathered at NIEHS July 16-17 for the Environmental Justice Stakeholders Implementation Meeting.



### [Educating the next generation of environmental health scientists](#)

Trainees took center stage at a meeting of grantees and participants in the Human Genes and the Environment Research Training Program July 9 at NIEHS.



### [Fellow takes on the role of writer and research support specialist](#)

Heather King, Ph.D., a former fellow in the Laboratory of Structural Biology at NIEHS, made a move in June to start her new career as an environmental writer.



### [NTP fellow wins 1st Place Young Investigator Award](#)

NTP visiting fellow Xiaohua Gao, M.D., Ph.D., was recognized by the Society of Toxicologic Pathology at its 31st Annual Symposium June 24-28 in Boston.

## Science Notebook



### [Young EH researchers shine at ONES symposium](#)

NIEHS held its sixth annual Outstanding New Environmental Scientist award symposium July 10-11 to highlight a group of especially promising young researchers.



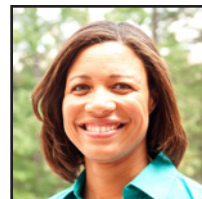
### [Mediating the body's clock and metabolism](#)

A new study by NIEHS researchers demonstrates the role of nuclear receptors in regulating the body's circadian rhythm and metabolic genes.



### [Former NIEHS trainees return for ONES symposium](#)

For several participants, the Outstanding New Environmental Scientist awardees meeting July 10-11 at NIEHS also meant a visit to their postdoctoral alma mater.



### [Comparative genomics researcher gains toxicology certification](#)

NIEHS staff scientist Elena Braithwaite, Ph.D., is the latest Institute scientist to earn a Diplomate of the American Board of Toxicology certification.



### [Nunnari delivers dynamic talk about mitochondrial biology](#)

University of California, Davis professor Jodi Nunnari, Ph.D., communicated her enthusiasm for mitochondrial biology in a captivating seminar June 25 at NIEHS.

## NIEHS Spotlight



### [NIH-funded Nanomaterial Registry now available online](#)

Researchers can now access a wealth of information at the Nanomaterial Registry, launched this summer by RTI International and funded in part by NIEHS.



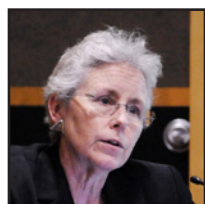
### [Dartmouth SRP video addresses mercury exposure in seafood](#)

The NIEHS-funded Superfund Program has released a 12-minute video that outlines important information about mercury in seafood for consumers.



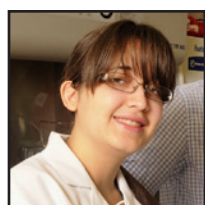
### [Promising environmental health researchers receive Superfund award](#)

Three talented Superfund Research Program trainees received the 2012 K.C. Donnelly Externship Award Supplement.



### [Bright future planned for RTP](#)

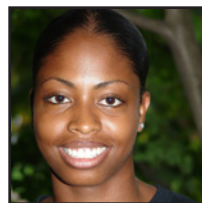
If Research Triangle Park planners have their way, more retail, residential, hotel, and educational facilities may make RTP bustle after hours, as well as during the day.



### [Summer intern wins highly competitive NIH scholarship](#)

Unlike far too many college seniors facing a tough economy, NIEHS intern Yasmin Crespo-Mejias knows exactly where she'll be after she graduates next spring.

## Science Notebook



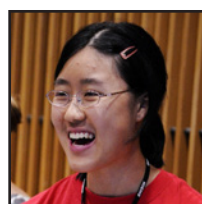
### [Study examines the role of timing in breast cancer risk](#)

A new study co-funded by NIEHS suggests that women can significantly reduce their risk of breast cancer later in life by being physically active before or after menopause.



### [Grantee explores the relationship between DNA damage and aging](#)

ONES awardee Laura Niedernhofer, M.D., Ph.D., stayed an additional day beyond the grantees' annual meeting to discuss her research in mouse models of accelerated aging.



### [NIEHS summer interns learn from experience, and the experienced](#)

Expectations were high, as dozens of students gathered in Rodbell Auditorium for a series of seminars to complement their lab work in the NIH Summer Internship Program.



### [Research team uncovers a new cellular stress response mechanism](#)

A team of NIEHS-funded researchers applied innovative technologies to discover a step-wise process in the mechanisms of cell defense against toxic chemicals.



### [New approach to alleviate chronic pain in diabetic patients](#)

A new study funded by the NIEHS Superfund Research Program describes a novel mechanism for treating the chronic neuropathic pain associated with diabetes.

## Inside the Institute



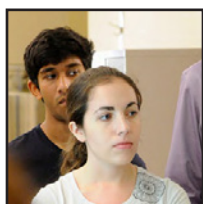
### [NIH celebrates LGBT Pride Month](#)

NIH observed Lesbian, Gay, Bisexual, and Transgender (LGBT) Pride Month June 29 with a panel discussion in Lipsett Auditorium on its Bethesda, Md., campus.



### [Organizers call for upping Feds Feed Families goal](#)

The 2012 campaign at NIEHS opened June 27, with a challenge from NIEHS/NTP Director Linda Birnbaum, Ph.D., to “Beat Your Best.”



### [Student tour highlights summer internship opportunities](#)

College students involved in a summer program housed at Duke University enjoyed something a little different during their tour of NIEHS July 17.

## Science Notebook



### [This month in EHP](#)

This month's feature stories in Environmental Health Perspectives tackle the timely issues of ultraviolet radiation exposure and emotion-based judgments about science.



### [Upcoming workshop on human genomic plasticity](#)

An innovative interagency program is now accepting early registrations for a free workshop exploring human genomic plasticity Oct. 4-5 in Washington, D.C.

## Extramural Research

### [Extramural papers of the month](#)

- [Naphthalene exposure in children](#)
- [Inhalation of nanoparticles from cosmetics](#)
- [Transgenerational effects from BPA exposure](#)
- [Prenatal butylbenzyl phthalate and eczema](#)

## Intramural Research

### [Intramural papers of the month](#)

- [Agricultural Health Study examines fungal sensitization in farmers](#)
- [DNA polymerase zeta directly promotes somatic hypermutation in B lymphocytes](#)
- [SIRT1 regulates hepatic bile acid homeostasis](#)
- [NRF2 regulates retinoid X receptor alpha](#)

## Calendar of Upcoming Events

- **August 3**, in Rodbell A, 11:00 a.m.-12:00 p.m. — Laboratory of Reproductive and Developmental Toxicology Seminar Series, featuring Evan Simpson, Ph.D., presenting “A Tale of Disregulated Metabolism and Inflammation”
- **August 3**, in Rall F193, 11:00 a.m.-12:00 p.m. — Special Scientific Seminar, “Compartmentalized Signaling and Tumorigenesis: Insights from Intersectin,” by John O’Bryan, Ph.D.
- **August 7**, in Rodbell Auditorium, 10:00-11:00 a.m. — Office of the Director Seminar, featuring Alan Guttmacher, M.D.
- **August 7**, in the Executive Conference Room, 12:00-1:00 p.m. — Receptor Mechanisms Discussion Group with Sue Fenton, Ph.D., discussing “Mammary Gland as a Sensitive Target Tissue for Endocrine Disruption”
- **August 8**, webinar, 11:30 a.m.-1:00 p.m. — PEPH Webinar, “Science-based Decision Making,” speakers TBA, [registration](#) required
- **August 22**, in Rall D350, 9:45-11:00 a.m. — Pulmonary inflammation seminar, featuring Hong Wei Chu, M.D.
- View More Events: [NIEHS Public Calendar](#)



# NIEHS Spotlight

## NIEHS hosts French delegation


By Eddy Ball

NIEHS leadership welcomed representatives of the French national health and medical research institute [Inserm](#) June 27, and heard a presentation by them on “Recent Changes in French Life Sciences and Health Research: Opportunities for Cooperation.”

Inserm, which is analogous to NIH, but on a much smaller scale with an annual budget of approximately one billion dollars, is reassessing its role in environmental health research, as part of its 2010-2015 strategic plan, and looking for guidance from the leadership and top scientists working at NIEHS. The organization is part of the French National Alliance for Life Sciences and Health (Aviesan), formed in 2009.





*Damerval spoke with enthusiasm about the Inserm vision for moving forward with the highest quality health research. He said that leaders in French life science and medical research are working to fulfill a mandate from the French public, to better understand how environmental influences impact health. (Photo courtesy of Steve McCaw)*



**Linked video:**  
[Watch an interview with Aviesan President and Inserm CEO André Syrota, M.D., Ph.D. \(03:18\)](#)

(Launches in new window)

Download Media Player:  Flash 

Representing Inserm were presenters Deputy Director-General [Thierry Damerval, Ph.D.](#), and Chief Scientific Counselor Jean-Marc Egly, Ph.D., as well as Mireille Guyader, Ph.D., director of Inserm’s U.S. office. Along with their presentation, the Inserm delegation met with NIEHS Director Linda Birnbaum, Ph.D., Deputy Director Rick Woychik, and several of the Institute’s senior lead researchers, including Samuel Wilson, M.D., Thomas Kunkel, Ph.D., Darryl Zeldin, M.D., John Bucher, Ph.D., Rick Paules, Ph.D., and Stavros Garantziotis, M.D.

### Expanding the environmental focus of Inserm-funded research

“Inserm is the only French public research organization to focus entirely on human health,” Damerval said, as he began his presentation and pointed to differences between Inserm’s institutes without walls and U.S. health research organizations.



*Under the leadership of Egly, who is an international leader in the area of DNA repair, Damerval said that standards for Inserm-funded research have achieved new heights. Egly acknowledged the need to educate the French public about the environmental health sciences. (Photo courtesy of Steve McCaw)*

“We don’t have our own campus [infrastructure],” he explained. “All of our labs and research are located inside university hospitals and university campuses.”

At the 83 French universities where Inserm funds programs, research ranges from basic through clinical, translational, and technology transfer, to public-private intellectual property development and public health. Inserm has pinpointed three priorities in its national strategy for research and innovation:

- Health, welfare, food, and biotechnologies
- Information and communication, nanotechnologies
- Environment and eco-technologies

Asked by Wilson about Inserm’s interests in environmental health, Damerval looked to advancing human and environmental toxicology, and pointed to the French public’s concerns about genetically modified organisms, chemical exposures, and nuclear energy. The group’s strategic plan also focuses on the rise in noncommunicable diseases, such as metabolic, neurological, and cardiovascular disease with known or suspected involvement of environmental exposures, as well as the emergence and re-emergence of infectious diseases.

“Before, making good science was enough,” Damerval said. “Now making good science is necessary, but we need also to have different organizational means to develop the other part [its application in public health and prevention].”

In his talk, Damerval struck several themes familiar to his NIEHS audience. Like its counterparts in the U.S., Inserm recognizes that research in the emerging new biology will need to be cross-disciplinary, international, and integrated. Damerval said that medicine will increasingly have to focus on the molecular anticipation of disease, before the appearance of perceptible symptoms.

Inserm has adopted the NIH 4 P’s paradigm, to guide medicine that will be predictive, personalized, preemptive, and participatory, as well as take increasing account of ethical considerations.

During the question and answer segment of the presentation, NIEHS scientists asked Damerval about some of the concerns the U.S. and France share. These included privacy considerations in access to databases, recruitment and retention of physician scientists, cultivating the next generation of biomedical researchers, and the relationship between basic and clinical research.



*As the presentation host, Birnbaum introduced Damerval and moderated questions from the audience. She was the leader of the Office of the Director initiative that brought the Inserm delegation to NIEHS. (Photo courtesy of Steve McCaw)*



*Shown in the audience are Kunkel, right, and Guyader, who will host Birnbaum’s planned visit to the French Embassy in Washington, D.C. (Photo courtesy of Steve McCaw)*



Birnbaum closed the event with a prediction about a productive relationship between Inserm and NIEHS for the future. “We look forward to many future interactions,” she said, holding out the promise for more sharing of ideas and possibly research collaborations to come.



*Wilson, left, made notes as he, Egly, and Kunkel, in background, listened to Damerval’s description of the range of research supported by Inserm. (Photo courtesy of Steve McCaw)*



*Garantziotis, who is both a basic and clinical researcher, wanted to learn more about how Inserm, with its national network of clinical research, facilitates the kinds of collaborations he has helped develop at NIEHS. (Photo courtesy of Steve McCaw)*

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## HHS/NIEHS meeting advances environmental justice initiatives

*By Eddy Ball*

Nearly 100 attendees gathered at NIEHS July 16-17 for the Environmental Justice (EJ) Stakeholders Implementation Meeting. Attendees represented non-profit advocacy groups, universities, and government agencies across the U.S.

Moderated by Sandra Howard, senior environmental health advisor in the HHS Office of the Assistant Secretary for Health, and [Joseph \(Chip\) Hughes](#), director of the NIEHS Worker Education and Training Program (WETP), the meeting was a key component of the [HHS 2012 Environmental Justice Strategy and Implementation Plan](#) launched formally in February. Following a decade of limited progress toward the goals of EJ, the plan is designed to revitalize the federal government’s commitment to the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.



*Howard could barely contain her excitement about the response to the HHS EJ initiative. “At last, there’s electricity being generated for this plan.” (Photo courtesy of Steve McCaw)*

The agenda featured keynote presentations by [Nadine Gracia, M.D.](#), acting HHS deputy assistant secretary for minority health, and [Juliet Choi, J.D.](#), chief of staff and senior advisor in the HHS Office for Civil Rights, as well as special topic panels for general attendees and working groups planning for next steps ([see text box](#)). Several meeting goers also attended an Interagency Working Group on EJ town hall meeting the evening of July 16 in Durham, N.C., exploring how the federal government can meet its responsibilities and work effectively with communities experiencing EJ issues.

### Underscoring the HHS/NIEHS commitment to EJ

Speaking on behalf of NIEHS Director Linda Birnbaum, Ph.D., NIEHS Division of Extramural Research and Training Director [Gwen Collman, Ph.D.](#), described Birnbaum's commitment to EJ and the range of programs funded by NIEHS that have promoted community engagement and capacity building to further environmental public health. "True partnership involves everyone in a meaningful manner," she said of the touchstone for effective EJ efforts by NIEHS.

Presentations by Howard and Vernice Miller-Travis, vice chair of the Maryland State Commission on EJ and Sustainable Communities, outlined the goals of the implementation plan. Howard listed four broad objectives for the meeting — sharing the status of the plan, obtaining shareholder input, identifying potential partnerships, and defining stakeholder suggestions for the future.

Referring to the excitement, energy, and progress during the six years that followed the [1994 Executive Order](#) on EJ, Miller-Travis said of the plan, "What we're really doing is reinvigorating the incredible work that's been done before." Despite the stagnation that followed those early years, she acknowledged ongoing EJ contributions by NIEHS programs, notably the WETP Minority Worker Training Program managed by [Sharon Beard](#), which has trained more than 10,000 individuals. "You know that lives have been changed," Miller-Travis said, "in places where things were hopeless before."

### HHS officials reach out to attendees

In her talk on "Reaffirming Our Commitment: Advancing EJ at HHS," Gracia assured attendees of the commitment of officials, at the highest levels of government, to the principles of EJ and described hopeful signs as the movement prepares to enter its third decade. "We believe that all Americans have the right to live healthy lives," she said. "We at HHS are proud to be a part of reinvigorating EJ." Gracia pointed to recent initiatives, including the Affordable Care Act, Healthy People 2020, and the Surgeon General's National Prevention Strategy, that will help achieve the goals of EJ, even if they don't use the specific vocabulary of EJ.



*Collman told the audience, "The NIEHS has played an important role in promoting EJ," and backed up the statement with an impressive list of the ways the Institute continues to support EJ through programs, initiatives, and meetings. (Photo courtesy of Steve McCaw)*



*One of the most moving personal narratives occurred early in the meeting, during the Community Stakeholder Panel. Duplin County, N.C., resident Elsie Herring described living next to a hog waste lagoon, as she struggles with powerful industrial interests to protect her property rights. "It's like living in a prison." (Photo courtesy of Steve McCaw)*



Because many attendees admitted they hadn't known HHS even had an Office of Civil Rights, they seemed especially interested in the talk July 17 by Choi on "Leveraging Federal Civil Rights Law to Combat Environmental Injustices and Health Disparities." Although she was naturally cautious about getting too specific and understandably unwilling to discuss cases currently in litigation that could illuminate the intersection of civil rights, [HHS Title VI requirements](#) protecting equal opportunity, and EJ, Choi encouraged people in the audience to learn more about their rights, by contacting her office directly concerning civil rights issues in their communities.



NIEHS grantee Gary Grant, center, took issue with the use of the word "minority" to describe those injured by environmental injustice. "The people of color are the majority getting dumped on," he said. He is shown with fellow panelists, shown right to left, Herring, Chandra Taylor, J.D., of the Southern Environmental Law Center in Charlottesville, Va., and Howard. (Photo courtesy of Steve McCaw)



Several speakers singled out Beard for her work in the Minority Workers Training Program and other WETP efforts, and, during the final panel discussion, Howard described her as the wizard of RTP (Research Triangle Park). (Photo courtesy of Steve McCaw)

## Moving EJ forward – Actions, future partnerships, and next steps for engagement

The meeting's panel discussions led up to four breakout sessions July 17 in the areas of HHS EJ actions policy development and dissemination; education and training; research and data collection, analysis, and utilization; and services.

The deliberations culminated in reports to the entire group and a panel discussion on "Suggestions for Implementation of EJ Actions, Future Partnerships, and Next Steps on Stakeholder Engagement and EJ Strategy Implementation." Howard was joined on the panel by NIEHS Senior Advisor for Public Health [John Balbus, M.D.](#); Goldman Environmental Prize winner [Hilton Kelley](#) of the Community In-Power and Development Association of Port Arthur, Texas; and Suzanne Condon, associate commissioner and director of the Bureau of Environmental Health at the Massachusetts Department of Public Health.

Recurrent themes in recommendations included better documentation of disparities at the community level, and more effective engagement and education of local government officials; expanding the use of Health Impact Assessments for the potential effects of projects on health; utilization of new technologies, such as geographic information systems and electronic medical records; development of persuasive cost and benefit analyses to outline the economic advantages of improving health through EJ; nurturing citizen involvement, through what veteran advocates call crowd-sourcing and ground-truthing; taking more advantage of federal resources through regional offices; and improving outreach to community resources, such as health centers, clinics, and community colleges.

Above all, panelists agreed, the momentum needs to continue to increase and the community needs to be proactive in terms of involvement. "Let's keep talking," said Condon. Striking a similar note, Balbus told the audience, "The community is grateful for the revival [of EJ support], but we don't want to go back [to the inertia of the previous decade]." As one attendee noted, staying engaged is critical. "If you're not at the table," she said, "often you're on the menu."



*NIEHS Program Analyst Liam O'Fallon is coordinator of the Partnerships for Environmental Public Health, an umbrella program for the Institute's EJ efforts. In a report from his working group, he said, "We need to make sure we're not reinventing the wheel." (Photo courtesy of Steve McCaw)*



*Gracia pointed out how much needs to be accomplished in order to truly realize the goals of EJ. Still, she said, "To see how far we've come is meaningful." (Photo courtesy of Steve McCaw)*



*"EJ impacts the food we eat, where we sleep, and where we can't sleep," Choi explained. Negative health consequences in disenfranchised communities form the core of the approximately 10,000 complaints her office investigates each year. These complaints, she reminded her listeners, include ones brought by her office, as well as ones self-initiated by people affected by environmental injustices or concerned citizens. (Photo courtesy of Steve McCaw)*



*Kelley, left, was one of several nationally recognized leaders of the EJ movement. He has been honored for his work with communities impacted by oil refineries along the Gulf Coast. (Photo courtesy of Steve McCaw)*



*Also on hand was Heinz Award for the Environment and Jane Jacobs Medal winner Peggy Shepard, director and co-founder of [West Harlem Environmental Action, Inc. \(WE ACT\)](#). (Photo courtesy of Steve McCaw)*

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# Educating the next generation of environmental health scientists

By Ashley Godfrey

Trainees took center stage at a meeting of grantees and participants in the Human Genes and the Environment Research Training Program July 9 at NIEHS. The meeting brought together graduate students, postdoctoral trainees, and training directors from the three universities, awarded grant funding in 2007 to develop innovative new training programs, in an effort to bridge the gap between genomics and environmental health sciences research ([see text box](#)).

The program, which is led by NIEHS and the National Human Genome Research Institute (NHGRI), is a component of the NIH Genes, Environment, and Health Initiative, a multi-institute program developed to speed up research on the causes of common diseases.

“The intent of this funding opportunity is to produce trainees who can unravel the influences of both the environment and genetic factors, and who can develop new technologies in these fields,” explained Carol Shreffler, Ph.D., program officer for training and career development in the NIEHS Division of Extramural Research and Training (DERT).

## Nurturing young researchers

In her opening remarks, DERT Director Gwen Collman, Ph.D., gave a brief overview of the new [NIEHS strategic plan](#), which will guide the Institute for the next five years. Collman described some of the strategic goals that will aid in achieving the Institute’s mission, in particular, goal number nine, which specifically speaks to the importance of education and training.

In order to move a more transformative environmental health sciences field forward, Collman said, attention needs to be paid to inspiring a diverse and well trained group of scientists. She stressed that this requires increasing the role of transdisciplinary training and recruitment of scientists, from a wider range of scientific disciplines and diverse backgrounds, to build greater diversity in the environmental health sciences workforce.

## Defining a new interdisciplinary training program

During the program introduction, Shreffler explained that the goal of the program is to train a new generation of researchers who are equally at home in both genomics and environmental health sciences. This task requires defining a new interdisciplinary team approach to training and mentoring postdocs and graduate students.



*Collman provided a short introduction about the Institute’s mission and how innovative training programs fit within the new strategic plan that will govern NIEHS for the next five years. She stressed that training and education play a major role in fulfilling the Institute’s research goals. (Photo courtesy of Steve McCaw)*



*Students and training directors from the three programs, as well as DERT health scientists, listened as Shreffler described the program’s history and its objectives. (Photo courtesy of Steve McCaw)*

Instead of focusing their training in just one research area, trainees should learn to interact seamlessly with scientists from both disciplines. The young researchers would then gain the skills necessary to speak both scientific languages and feel at home working within both fields, instead of just one or the other.

The training opportunities are structured so that each trainee is supervised by a team of at least two mentors, one with expertise in the relevant environmental exposure or exposure biology aspect of the research, and the other with relevant genetic and genomic expertise. Funding to develop new curriculum components within each university is also built into the training grants, to provide trainees with a common unifying set of skills and knowledge.

### Filling a training need

According to Shreffler, this kind of interdisciplinary training and research was rare prior to the training grant, and the three funded programs have all been very successful at establishing a working model for disseminating the new paradigm to additional programs. Bringing students together, from each of the universities, to present their research and learn about research from their peers at the meeting was a part of encouraging and creating an environment that enables students to integrate the different scientific disciplines.

Another important training component stressed in all three programs is career development and progression to independence for senior level trainees and postdocs. According to presenters, conventional training programs too often overlook such skills such as communication and personnel, budget, and laboratory management, forcing new investigators to learn these necessary skills on the job.

“If we [as senior researchers] are bad mentors and not paying close attention, we may lose students who fall through the cracks,” stated Terrence Monks, Ph.D., project leader for the University of Arizona training program.

(Ashley Godfrey, Ph.D., is a postdoctoral fellow in the Molecular and Genetic Epidemiology Group in the NIEHS Laboratory of Molecular Carcinogenesis.)



*Moderator for the Gene-Environment Interactions Training Program, Michael Borchers, Ph.D., an assistant professor at the University of Cincinnati (UC), explained the unique history behind the university, which has made it a hub for environmental health studies in the Midwest. He also stressed that the UC program allows its students to explore cutting-edge technologies that help them to learn how to think outside the box and make new research discoveries. (Photo courtesy of Steve McCaw)*



*Everyone gathered around to listen to the students present their research in short 10 minute talks, giving both students and program directors a chance to see what types of research students at the other universities were doing. The daylong program also included a grantsmanship workshop, a tour of NIEHS, and a visit to two labs in the intramural research program. (Photo courtesy of Steve McCaw)*



## Training programs in human genes and the environment

**Interdisciplinary Training in Genes and the Environment** — Harvard University School of Public Health, project leader [Marianne Wessling-Resnick, Ph.D.](#)

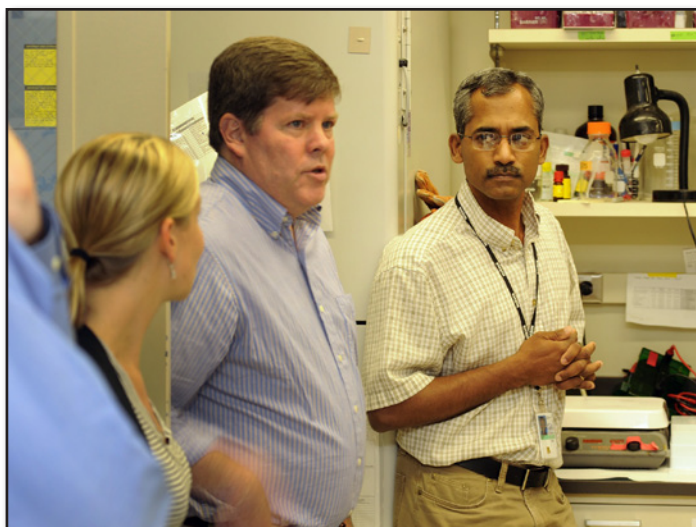
This program will address the critical need for well-trained scientists who have an understanding of, and commitment to, cutting-edge research at the intersection of molecular and environmental exposure biology, and statistical and computational methods. The training program will involve active participation by 30 accomplished and experienced multidisciplinary faculty members, including environmental health scientists, molecular biologists, molecular epidemiologists, computational biologists, biostatisticians, and bioinformaticists. The two goals of the program are to train true collaborative partners and to encourage interdisciplinary research, especially in genetics and the various omics platforms arising from new methodologies. The program proposes support of 8 predoctoral students, in years 3-8, as well as support for training of one postdoctoral fellow per year. All trainees will be provided an outstanding opportunity to become equally skilled in genomics, environmental health sciences, and quantitative methods, in order to attain leadership roles in interdisciplinary studies of human genes and the environment, with the ultimate goal of serving public health interests in developing effective disease prevention and intervention strategies.

**Gene-Environment Interactions Training Program** — University of Cincinnati, project leader [Daniel Nebert, M.D.](#)

The goal of this program is to train predoctoral and postdoctoral students, who will be versed in the ways that environment exposure and genetic diversity interact to alter the onset of disease. Achieving this objective requires an interdisciplinary team approach and the collaborative efforts of research faculty, clinicians, postdoctoral, and predoctoral trainees. A mentorship team approach will be used to educate trainees in multiple areas of gene-environment interactions. Predoctoral training will include required coursework, laboratory rotations with the team of mentors, and hands-on work in several areas of exposure assessment, high-throughput genetic variability measures, and biomarkers of exposure and disease. Postdoctoral training will include programs in laboratory and personnel management, pilot grant applications, and an intensive yearlong grant-writing workshop to prepare them for independent research.

**Human Disease and the Interplay Between Genes and the Environment** — University of Arizona, project leader [Terrence Monks, Ph.D.](#)

This program will establish a Human Genes and the Environment Research training program. It will build upon three interdisciplinary predoctoral and postdoctoral training programs integral to the creation of a successful multidisciplinary training program that trains scientists in environmental genomics and genetics. The curriculum has been created specifically to address the unique requirements of a multidisciplinary training program. This is especially important for the new generation of scientists who will need to communicate effectively across multidisciplinary boundaries. The training program faculty consists of a core of 17 scientists, from 10 departments. Six principle units are participating in this training program and five of those units are members of the BIO5 Institute, which brings together scientists from disparate disciplines to solve complex biological problems. To ensure the program is known for its multidisciplinary emphasis, it will be administratively housed within BIO5.



*NIEHS Special Assistant for Community Engagement and Outreach John Schelp, center, led the visitors on a tour of NIEHS, which included a stop at the Clinical Investigation of Host Defense Group lab. While there, they heard postdoctoral fellows Kymberly Gowdy, Ph.D., left, and Jim Aloor, Ph.D., describe their research and answer questions about working at NIEHS. (Photo courtesy of Steve McCaw)*

*At their final stop on the tour, the group enjoyed an impromptu hallway talk by postdoctoral fellow Daniel Gilchrist, Ph.D., on transcription of RNA polymerase II. Gilchrist is a member of the NIEHS Transcriptional Responses to the Environment Group. (Photo courtesy of Steve McCaw)*

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## Fellow takes on the role of writer and research support specialist

*By Sonika Patial*

Heather King, Ph.D., a former fellow in the Laboratory of Structural Biology (LSB) at NIEHS, made a move in June to start her new career as an environmental writer. King will be working primarily on science and research program support projects involving MDB, Inc. and the NIEHS Division of Extramural Research and Training.

At NIEHS, King worked on a collaborative project between the Protein Expression Core Facility in LSB headed by Robert Petrovich, Ph.D., and Trevor Archer, Ph.D., lead researcher and chief of the Laboratory of Molecular Carcinogenesis (LMC). In Archer's group, King investigated the human SWI/SNF chromatin remodeling complex, by preparing protein and protein fragments from this complex and using them for antibody production, biochemical assays, and crystallization trails.

When asked about her job search, King said that beginning in her fourth year, she occasionally applied for jobs that seemed to be a good fit for her science skills, mostly related to protein biochemistry. "For these jobs, I had the basic bench skills they were looking for, but nothing to distinguish me or to indicate that I was an especially good fit," she said.



*During her tenure at NIEHS, King sought out opportunities to hone her skills for communicating science to a variety of audiences. (Photo courtesy of Steve McCaw)*

However, she soon realized that the skills that seem more everyday, such as writing, critical reading, and editing, were some of her strongest and most marketable. For King, the hardest part was learning to not focus too much on what made her similar to other postdocs, but to appreciate the attributes that distinguished her. And, in King's case, these included a general love of language as well as the experience she had in the four years between college and graduate school, which were an important factor in her success.

### Effective writing skills developed over time

King started writing during her first job, when she worked at a consulting engineering company on a remediation contract for the U.S. Army. Her work there involved a tremendous amount of writing and document preparation, in addition to analyzing environmental problems and new remediation technologies.

During her tenure as a postdoctoral fellow at NIEHS, she took advantage of opportunities in her lab to help out with any editing or writing tasks, which turned out to be a good practice in general. King was also a member of the NIH Fellows Editorial Board, which provides fellows an opportunity to take part in a formal editing forum and to interact with others who are interested in editing and writing.



*Like many of his colleagues at NIEHS, Petrovich takes his responsibilities as a mentor seriously, by supporting trainee involvement in career development activities. (Photo courtesy of Steve McCaw)*

## The importance of good mentoring

King credits Petrovich with helping to motivate her to begin searching for a job. "My supervisor, Bob, has acted as a second mentor for many postdocs, and has experience in industry, as well as government and academic jobs, so he knows how tough it can be to find the right job at the last minute," she said. "He encouraged me to start thinking about my post-postdoc life early on."

According to Petrovich, one of King's main strengths was her ability to see the bigger picture on the project, not just to focus on what's in front of her, but also to explore how the different projects within the lab interact. As a bonus, she also enjoyed writing. "We talked a great deal about what she wanted to do next, and when the position at MDB came up, fortune favored the prepared and I lost a good postdoc," he added with a laugh.

King also collaborated extensively with Archer. "Trevor was also very helpful in giving me opportunities to write, review, and edit," she said. King published a review article with Archer and biologist Kevin Trotter on glucocorticoid signaling and chromatin remodeling, which helped her when she was interviewing for the position. "Review writing shows a skill set that's important for any science writer or communicator — reading, analyzing, and writing about scientific literature," she added.

"Writing for the eFactor and working with Eddy Ball, Ph.D., the editor of the NIEHS newsletter, was also a great experience for me. "MDB, Inc., works with Eddy on newsletter stories, and he was able to put in a good word for me," King added.



In addition, she attended American Scientist pizza lunch seminars at nearby Sigma Xi headquarters. These monthly seminars are designed for people interested in science communication and offer many opportunities for networking.

“My neighbor, who works in science communications, invited me to go” King said. “In fact, I found out about MDB, Inc., from a former NIEHS fellow, who now works in DERT, while we were talking at one of the American Scientist pizza lunches at Sigma Xi.”

[MDB](#) is a privately owned strategic consulting firm that provides contract writing and several other support services for NIEHS extramural research groups, as well as other government agencies such as the U.S. Environmental Protection Agency and the National Science Foundation.

(Sonika Patial, D.V.M., Ph.D., is a fellow in the Laboratory of Signal Transduction at NIEHS.)

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## NTP fellow wins 1st Place Young Investigator Award

*By Eddy Ball*

NTP visiting fellow [Xiaohua Gao, M.D., Ph.D.](#), was the winner of the 1st Place Young Investigator Award for research presented at the Society of Toxicologic Pathology (STP) 31st [Annual Symposium](#) June 24-28 in Boston. Her abstract, titled “Effects of Cadmium on Receptor Tyrosine Kinase (RTK) Phosphorylation, MAPK Activation, and Estrogen Receptor (ER) Alpha and Beta Binding *In Vitro*,” was selected from a pool of all the young investigator submissions for the meeting.

Gao is a member of the Molecular Pathogenesis Group headed by [Darlene Dixon, D.V.M., Ph.D.](#), of the NTP Laboratory. A physician with a Ph.D. in toxicology, now in the fourth year of her fellowship, Gao has successfully applied her knowledge of medicine and toxicology to understanding the molecular basis of disease and deciphering the pathogenesis of changes induced by environmental toxicants. In addition to her STP award, Gao has been the first author on [two papers](#) published by the group in peer-reviewed journals, as well as another one now under review, and a co-author on four others.

“I’m very proud of Dr. Gao’s accomplishment in winning this award,” Dixon said. “I think it acknowledges Xiaohua’s outstanding work as a research toxicologist in training and reflects very favorably on the quality of the [NTP postdoctoral training programs](#).”

Posters were evaluated and scored for experimental design, clarity, data interpretation, quality of visual aids, and impact of research by a panel of international investigators from the STP Career Development and Outreach Committee, as well as the Annual Symposium Poster Committee. Gao was also evaluated and scored for her presentation of the data.



*“I’m very lucky to be working here,” Gao said. “I feel that Dr. Dixon’s mentoring has contributed greatly to advancing my career as a physician scientist specializing in toxicologic pathology.” (Photo courtesy of Steve McCaw)*



The award-winning research is part of work in the Dixon group on understanding the pathogenesis of toxicant-induced changes in the uterus and the role of toxicants in uterine disease. In the research presented at the STP, Gao proposed a non-classical estrogen receptor binding mechanism for cadmium-induced proliferative changes in uterine fibroid cells. Gao and Dixon plan to conduct additional studies to support their hypothesis.

NIEHS is one of several sponsors of the STP Annual Symposium, which also features a special premeeting, full-day [NTP Symposium](#) each year, featuring a number of NTP scientists addressing issues of interpretation in pathology.

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*After completing her doctor of veterinary medicine and doctor of philosophy degrees, Dixon served as a postdoctoral fellow at The Rockefeller University before joining NIEHS in 1987. She earned certification as a Diplomate in the American College of Veterinary Pathologists in 1987. (Photo courtesy of Steve McCaw)*

## NIH-funded Nanomaterial Registry now available online

*By Cindy Loose*

The complicated burden involved in searching for information about nanomaterials has been lifted. Researchers can now access a wealth of information at the [Nanomaterial Registry](#), launched this summer by [RTI International](#) and funded in part by NIEHS. The site is intended primarily for scientists, but is free to anyone.

Nanotechnology is one of the fastest growing technologies, with billions being invested by industry and government in products and processes that are being used today, and that hold even greater promise for tomorrow. Until now, massive amounts of information were scattered in various places, making data hard to access.

The registry was funded with \$2.9 million from the National Institute of Biomedical Imaging and Bioengineering, NIEHS, and the National Cancer Institute. It provides a resource that organizes and evaluates information about a wide variety of nanomaterials. It includes news about government reports and guidelines, and upcoming workshops and other information critical to those working in the field of nanotechnology.

“The registry is a valuable new tool that will save time and money for researchers looking to create new nanomaterials for innovative and practical products,” said Christopher Weis, Ph.D., senior



*Weis is the NIEHS Office of the Director lead on nanomaterials. He works closely with NTP lead Nigel Walker, Ph.D., and NIEHS Division of Extramural Research and Training lead Sri Nadadur, Ph.D., on the Institute's research initiatives to better understand nanomaterials and health. (Photo courtesy of Steve McCaw)*

toxicologist at NIEHS. “Perhaps even more important,” he added, “the registry will help researchers understand the physical and chemical nature of these materials, to help determine how they may affect biological tissues and organisms.”

### A multifaceted resource

The registry takes advantage of the growing library of available literature on nanotechnology. A team of specialists developed evaluation standards and criteria to ensure that information included from existing databases was reliable.

Nanomaterials can be searched at the web site by size, surface area, shape, and material type, and each of those categories is further subdivided. Material type, for example, is divided into 16 categories, such as metals, polymers, and carbons. Carbons are then divided into buckyballs, nanotubes, graphene, and graphite. The search by shape is divided into three-dimensional shapes, including nanocubes and quantum dots; two-dimensional shapes, such as nanowires; and one-dimensional shapes, such as nanoplates.

Even more refined searches allow researchers to pinpoint only those nanomaterials that have a particular characteristic, such as reactivity, solubility, or stability.

### An evolving tool for researchers

The registry will grow and improve as the quality and quantity of information on nanomaterials increases. In addition to the physical and chemical characteristics of nanomaterials, the site will be adding biological and environmental study data.

In the future, the Nanomaterial Registry will also provide predictive modeling, based on elaborate matching algorithms that are currently in development under the direction of [Michele Ostraat, Ph.D.](#), senior director of the Center for Aerosol and Nanomaterials Engineering at RTI, and the project’s lead researcher.

Researchers are encouraged to consult the minimal information standards set for the registry when designing nanomaterial studies, so that data from their studies can be considered for the registry.



*In the RTI [press release](#) announcing the availability of the new registry, Ostraat was quoted as saying, “This registry will provide a valuable resource for nanotechnology stakeholders to find and investigate nanomaterials across diverse test methods, protocols, and data sources in this field.” (Photo courtesy of Jimmy Crawford and RTI International)*

## Nanomaterials — Benefits and concerns

Some nanosized materials occur naturally, such as proteins in the body, but of particular interest are nanomaterials that scientists are now able to engineer. One nanometer is approximately 100,000 times smaller than the diameter of a human hair. By definition, nanomaterials have at least one dimension that is less than 100 nanometers.

Nanotechnology represents one of the most exciting emerging sciences, with applications for creating and improving numerous consumer and commercial products. It holds great promise for boosting the economies of nations that take the lead in understanding and exploiting the unique properties that emerge when substances are engineered to nanoscale. However, the same optical, magnetic, and electrical properties that make nanomaterials potentially beneficial in drug delivery and product development also cause concern about their potential effects in the environment and, thus, on human health.

An advisory board of distinguished experts from the scientific community is guiding the development of the registry. Representatives to the board include those from private industry and academia, consumers, clinicians, medical practitioners, and government regulators.

RTI International is a leading research institute that provides research and technical expertise to governments and businesses in more than 40 countries.

(Cindy Loose is a contract writer with the NIEHS office in Bethesda, Md.)

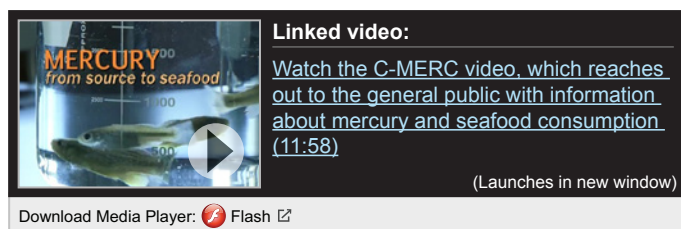
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## Dartmouth SRP video addresses mercury exposure in seafood

*By Sara Mishamandani*

The NIEHS-funded Dartmouth Toxic Metals Superfund Research Program (SRP) has released a 12-minute video that outlines important information for consumers about mercury in seafood. “Mercury: From Source to Seafood” is a web-based film that explains how mercury gets into the seafood we eat. It also describes the health benefits of eating low-mercury fish and the need to keep mercury from entering the environment.

The film is part of a research translation and outreach program funded by SRP to raise awareness of the health effects of mercury in seafood and to simplify the complexities surrounding seafood consumption.



*Chen is a project leader and research translation core leader for the NIEHS-funded Dartmouth Superfund Research Program. (Photo courtesy of Dartmouth College)*

### Understanding the risk of seafood consumption

Because of the health effects of mercury on neurodevelopment, pregnant women and young children are advised to avoid high-mercury fish, such as shark, swordfish, king mackerel, tilefish, and large tuna. However, as the video points out, low-mercury fish, such as salmon and tilapia, are very good for brain development and high in nutritional content, but may also be avoided by some consumers because of perceived risk from eating any seafood. The video explains this problem in an easily understood way, to inform consumers about what they should know when it comes to mercury and seafood consumption. It also emphasizes the need to take steps for getting mercury out of the environment.

“From our movie, I hope that people will understand where mercury comes from and that human activity is linked to mercury contamination in fish,” says [Celia Chen, Ph.D.](#), SRP research translation core team leader and research professor of biological sciences at Dartmouth. “I also hope that people understand there are low-mercury fish that are good for people to eat. Both these aspects of mercury are related to actions that people can take.”



## Collaborative gives direction to future research on mercury exposure

The video is just one outcome of the Coastal and Marine Mercury Ecosystem Research Collaborative (C-MERC), sponsored in part by the Dartmouth SRP program. The collaborative brought 50 scientists and stakeholders together to publish a series of 11 synthesis papers related to mercury and seafood consumption, the primary means of human exposure to mercury. The articles are intended to provide a review of current marine mercury research, to inform policy making. The first two articles were published in the June 2012 issue of *Environmental Health Perspectives*. A paper from a research team led by [Margaret Karagas, Ph.D.](#), reviews research on the human health effects of low-level exposures to mercury, and another from a group of scientists led by [Emily Oken, M.D.](#), explains the need for clear and cohesive advice on fish consumption, so seafood customers not only consider mercury contamination, but also the nutritional value, fishery sustainability, and economic issues.

### *Citations:*

[Karagas MR, Choi AL, Oken E, Horvat M, Schoeny R, Kamai E, Cowell W, Grandjean P, Korrick S.](#) 2012. Evidence on the human health effects of low-level methylmercury exposure. *Environ Health Perspect* 120(6):799-806.

[Oken E, Choi AL, Karagas MR, Mariën K, Rheinberger CM, Schoeny R, Sunderland E, Korrick S.](#) 2012. Which fish should I eat? Perspectives influencing fish consumption choices. *Environ Health Perspect* 120(6):790-798.

(Sara Mishamandani is a research and communication specialist for MDB, Inc., a contractor for the NIEHS Superfund Research Program, Worker Education and Training Program, and Division of Extramural Research and Training.)

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## Promising environmental health researchers receive Superfund award

*By Sara Mishamandani*

Three talented Superfund Research Program (SRP) trainees received the 2012 [K.C. Donnelly Externship Award Supplement](#), providing them an opportunity to enrich their research and extend their training in the field of environmental health science. Now in its second year, the annual award was established to honor environmental health researcher and superfund grantee Kirby Donnelly, Ph.D. The award supports SRP trainees, graduate students, and postdoctoral fellows who are pursuing transdisciplinary research, and emphasizes the importance of research application and collaboration to promote human health.

The award provides the SRP trainees with up to \$10,000 to fund supplies, travel, housing, and costs for research, training, and collaboration at other SRP centers, government laboratories, and state, local, or tribal agencies, for up to three months.



*Vanessa De La Rosa (Photo courtesy of Vanessa De La Rosa)*



## 2012 recipients

- **Vanessa De La Rosa, a graduate student at the University of California, Berkeley** — De La Rosa will travel to the University of North Carolina at Chapel Hill to support her current research on trichloroethylene (TCE). She will focus on TCE's metabolite, dichlorovinyl cysteine, and mechanisms that mediate TCE-induced renal cancer. Her research will provide insight into how DNA damage and repair facilitates toxicity and cancer due to TCE exposure.

“This research will supplement previous studies conducted in other organisms to identify conserved mechanisms of trichloroethylene toxicity,” said De La Rosa.

- **Steven O'Connell, a graduate student at Oregon State University** — O'Connell will travel to the Lower Duwamish Waterway Superfund site to work with U.S. Environmental Protection Agency (EPA) remediation specialists. He will conduct studies that use passive sampling devices to measure bioavailable contaminants in water and sediment. He hopes to further develop the technology and determine the levels of several contaminants found at the Superfund site prior to remediation.

“The externship will allow me to expand my knowledge base with professionals at the Lower Duwamish Waterway Superfund site, including scientists at EPA's Region 10,” said O'Connell. “Specifically, this opportunity will allow me to see how state, federal, and local parties collaborate with an ongoing Superfund remediation strategy, and how the bioavailable data I will provide might contribute.”

- **Sabine Vorrink, a graduate student at the University of Iowa** — Vorrink will undertake an externship at the University of Arizona to study the effect of polychlorinated biphenyls and deprivation of oxygen on the metabolism of liver and skin cells. She hopes to learn new molecular techniques to supplement her graduate work.

“This will extend my experience and scientific knowledge into related toxicology fields, and will significantly expand my training horizons,” said Vorrink.

The recipients of this year's awards will present their research at the SRP 25th anniversary meeting Oct. 21-24 in Research Triangle Park, N.C.

(Sara Mishamandani is a research and communication specialist for MDB, Inc., a contractor for the NIEHS Superfund Research Program, Worker Education and Training Program, and Division of Extramural Research and Training.)

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*Steven O'Connell (Photo courtesy of Steven O'Connell)*



*Sabine Vorrink (Photo courtesy of Sabine Vorrink)*

# Bright future planned for RTP

By Robin Arnette

During the weekdays, Research Triangle Park (RTP) bustles with activity, but after 5 p.m. and on weekends, the state's most recognizable district for research and development turns into a ghost town. Yet, if RTP planners have their way, the development of more retail, residential, hotel, and educational facilities may make it the place to go after hours, too.

According to Liz Rooks, executive vice president and chief operating officer for the Research Triangle Foundation of North Carolina, RTP is in the process of a grand revitalization. The foundation enlisted the help of a prominent New York architecture and urban design firm to develop a 50-year master plan that addresses the needs of the RTP community. Rooks came to the NIEHS campus June 26 to give an overview of the plan and to answer questions about the future of the Park.

Chris Long, deputy associate director for management at NIEHS, who has known Rooks for more than 20 years, hosted the talk. He thanked her for contributing so much to the growth of RTP.


"She's been with the foundation since 1989," Long said, "and I think for most people who work with the foundation, she is the RTP."



*Rooks, above, said an economic analysis of RTP found that private industry has an unusually large amount of research and development-funded projects at local universities. "We look at that in terms of dollars per graduate student, for comparable clusters in the country," she said. "For us, that number is \$23,000, but for other areas, the average is \$7,000." (Photo courtesy of Steve McCaw)*





*Those who couldn't attend the talk in Rodbell could view a webcast of the presentation. NIEHS employees emailed questions to Long, above, who posed them to Rooks. (Photo courtesy of Steve McCaw)*



North Carolina's  
**RESEARCH  
TRIANGLE  
PARK**  
An Investment in the Future

[Watch a documentary about the history of RTP that includes footage of the NIEHS campus, former NIEHS scientific director and Nobel Laureate Martin Rodbell, Ph.D., and past institute Director Kenneth Olden, Ph.D. \(57:16\)](#)

(Launches in new window)

Download Media Player:  Flash 

## RTP — a turning point for North Carolina

As Rooks explained, in 1959, North Carolina had the second lowest per capita income in the U.S., surpassing only Mississippi. With an economic system based on small-scale farming and three low-wage industries — textiles, tobacco, and furniture manufacturing — then North Carolina Governor Luther Hodges charged a committee of businessmen, academicians, and community leaders to come up with a way to improve the state's economy.

"We had three strong universities, but the graduates of those schools, particularly those in math and science, were leaving because they couldn't find jobs here," Rooks added. "The committee's idea was to bring research industry here and, with that, the Research Triangle Foundation was born."

The project needed seed money, so former state senator and former Wachovia Bank chairman Archie Davis, for whom Davis Drive is named, barnstormed the state, soliciting contributions from financial institutions,



big corporations, and ordinary citizens. Davis raised almost \$2 million for RTP. Once the land was acquired, a few small companies relocated to the area.

Job growth was slow early on, until the watershed year of 1965, when NIEHS became the first major tenant to announce that its campus would come to RTP. Several months later, IBM and another smaller company announced that they were also opening campuses in RTP. Today, more than 170 companies call RTP home. With more than 39,000 full-time workers and an annual payroll of \$2.9 billion, this 7,000-acre economic engine is poised to drive North Carolina and the region into a new era of prosperity.

### Planning for the next 50 years

Facing competition from international and domestic research clusters, Rooks said the foundation board undertook the [master plan](#) as a way of addressing the issues it saw coming. After surveying RTP companies on the Park's strengths and weaknesses, several themes became apparent.

Overwhelmingly, RTP's workforce is a strength, along with the park's tranquil pastoral environment. People come to the area for its global recognition and positive economic forecast. However, an aging building infrastructure, traffic congestion, and lack of amenities, such as specialty shops and housing, are challenges that were unforeseen when RTP started.

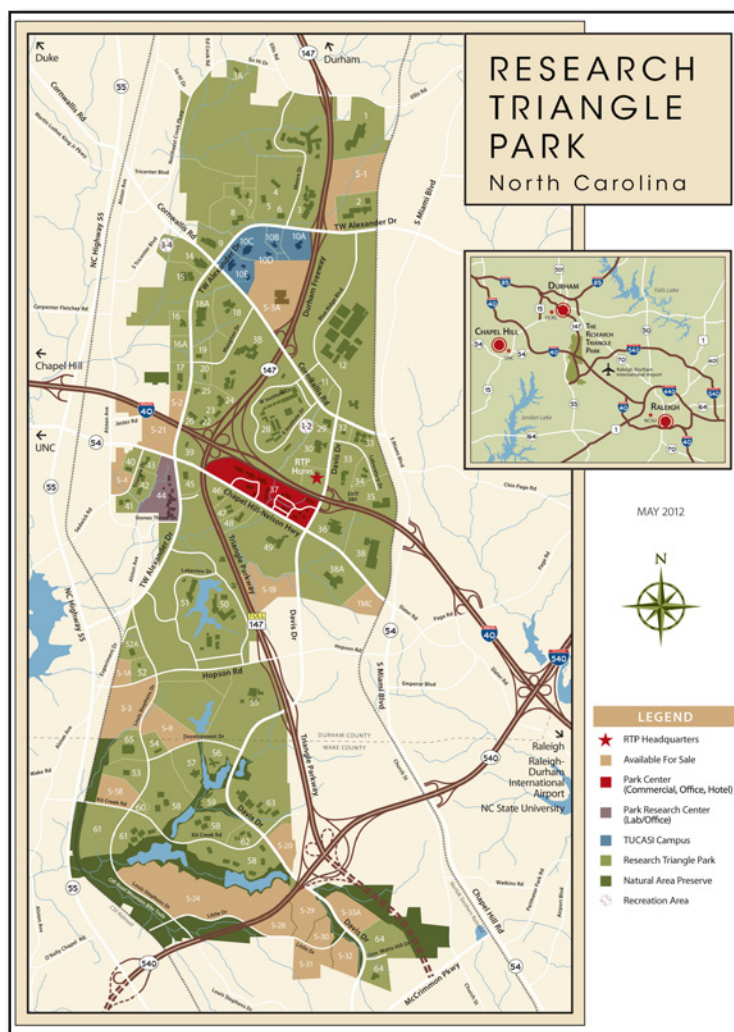
The plan has several overall goals, such as retaining existing tenants, continuing to attract large and small companies, and recruiting a broad range of new tenants, which should bring a variety of hotels and restaurants to RTP. The designs also include commuter rail stations, and developing common open places that preserve and enhance the Park's natural beauty. Rooks said the foundation also embarked on a new signage program last year that lets people know when they're in or out of the Park.

Rooks said that multiple projects will be phased in over time, and that the foundation will continue to work with Durham and Wake counties to build a better, stronger RTP.

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*John Schelp, center, from the NIEHS Office of Science Education and Diversity, and Joel Abramowitz, Ph.D., right, special assistant to the NIEHS Scientific Director, listened attentively to the presentation. Schelp believes the plan achieves a balanced approach. "They're trying to protect what's special about RTP," he said. (Photo courtesy of Steve McCaw)*



*RTP is 7 miles long and 2 miles wide. The master plan calls for making nodes within RTP more walkable. (Illustration courtesy of the Research Triangle Foundation of North Carolina)*



# Summer intern wins highly competitive NIH scholarship

By Eddy Ball

Unlike far too many college seniors facing a tough economy, NIEHS intern Yasmin Crespo-Mejias knows exactly where she'll be after she graduates next spring.

Thanks to an [Undergraduate Scholarship Program \(UGSP\)](#) award by NIH announced in July, Crespo-Mejias will spend next summer in Bethesda, Md., as a ten-week summer research employee in an NIH lab. She'll be working and learning there, as she decides when to fulfill the second condition of her scholarship for up to \$20,000 in 2012-2013 education and living expenses at the University of Puerto Rico — spending a year as a full-time research employee in Bethesda or at one of the remote locations, such as NIEHS.

Going into the competition, Crespo-Mejias knew that the odds were about 20 to 1 against her winning. As her notification from program director Darryl Murray, Ph.D., explained, “The UGSP is a highly competitive program for which we receive over 200 applications annually, and you are one of 11 nationwide to become a UGSP Scholar.”

“I was hopeful,” Crespo-Mejias said with her characteristic modesty, “but I never thought they'd pick me.”

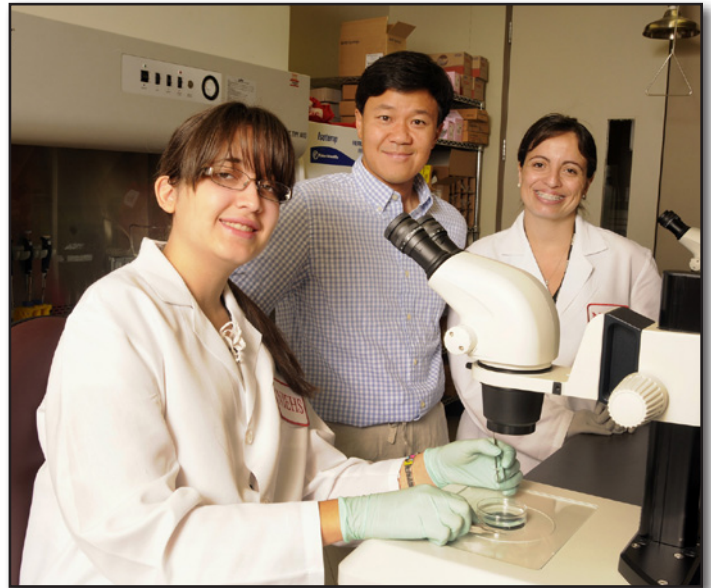
## A summer home at NIEHS

Now in her second summer at NIEHS working in the [Reproductive Developmental Biology Group](#) headed by Humphrey Yao, Ph.D., Crespo-Mejias knows the value of great mentoring by Yao, supervisory biologist Karina Rodriguez, Ph.D., and others in her lab.

Crespo-Mejias also appreciates her summers of learning and discovery under the guidance of senior scientists. “When I went back to school last year,” she recalled, “I was ahead in genetics and reproductive biology, thanks to my training here.”

Combined with her years of hard work in school, that advantage served her well in advancing a career she hopes will culminate in pursuing research as a physician-scientist when she completes an M.D. or M.D./Ph.D. program. She said she might eventually return to work in her native Puerto Rico, where there is a real need for more physicians and well-trained researchers.

With her poster from the [Summer Internship Program](#) last year ([see story](#)), Crespo-Mejias won a travel award to the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference Oct. 27-30, 2011, a feat that no doubt helped set her apart from other applicants for the UGSP award. Crespo-Mejias said she hopes to win support again this year for a trip to make a poster presentation at the upcoming [SACNAS National Conference](#) Oct. 11-14 in Seattle.



*Crespo-Mejias, left, joined mentors Yao, center, and Rodriguez at her microscope, where she has spent much of her time the past two summers. During her ten-week internship in 2011, she conducted a pilot study on bisphenol A. (Photo courtesy of Steve McCaw)*

“I’m very proud of Yasmin’s accomplishment,” Yao said. “I think the scholarship says much about the quality of Yasmin’s research and her solid work ethic, but it also reflects very favorably on the training at NIEHS and the support by NIH for the next generation of biomedical researchers.”

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# Science Notebook

## Young EH researchers shine at ONES symposium

*By Jeffrey Stumpf*

NIEHS held its sixth annual Outstanding New Environmental Scientist (ONES) Awardee Symposium July 10-11, to highlight the exciting research being performed by a group of especially promising young researchers. ONES awards provide early-career investigators with up to five years of support, to advance research designed to answer important questions about environmental health, as they build a laboratory, cohesive research group, and body of work to help establish themselves as full-fledged members of the research community.

Organized by Health Science Administrator Carol Shreffler, Ph.D., the ambitious agenda featured 27 talks by awardees, with introductory remarks by six program administrators who moderated the program.

NIEHS/NTP Director Linda Birnbaum, Ph.D., opened the symposium with a message underscoring the importance of supporting new researchers and ideas. “We are focused on developing the next generation of scientists,” Birnbaum stated. “We recognize that all of you are laying the foundation for the future of our scientific community.”

Birnbaum assured the audience of early-career investigators that the support will continue. “Our strategic plan [with its commitment to the development of new talent] isn’t just lip service,” Birnbaum explained. “I plan to back up these words with resources and funding that will ensure that this important stream of new talent continues to flow.”

### Meetings as a forum for collaboration

Bringing together the ONES awardees every year has fostered a familiarity that is unusual in forums of this kind. The ONES meetings have nurtured a level of collegiality that prompted awardee James Luyendyk, Ph.D., to thank his 41 mentors, a reference to the support he’s enjoyed from the other awardees. Another investigator, Angela Slitt, Ph.D., noted simply, “It’s awesome to see peers doing so well.”



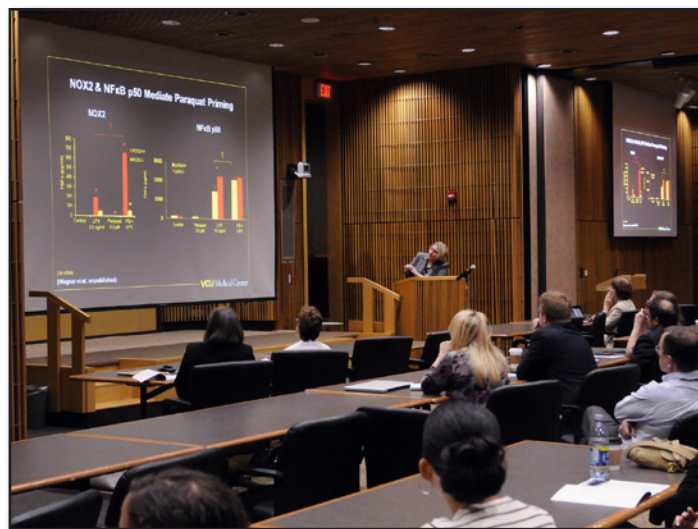
*The ONES program started in 2006 and was designed to attract young investigators to research fields that involve environmental health, by committing five years of generous funding. (Photo courtesy of Steve McCaw)*



*The diversity of the talks, as Birnbaum pointed out, demonstrates the difficulty in studying environmental health. “The breadth of issues shows the complicated landscape that spans from very basic molecular studies to clinical research and population based studies.” (Photo courtesy of Steve McCaw)*

Heather Stapleton, Ph.D., and Heather Patisaul, Ph.D., demonstrated that bringing together the bright young minds in environmental health research helps improve the quality of the science. “One of the most amazing things about the ONES program is how it has facilitated wonderful collaborations,” Patisaul said of the way she and Stapleton shared information about the new fire retardant chemical FM550 that could benefit both of their projects.

Joseph Shaw, Ph.D., agreed that interaction with his colleagues has advanced his research and career. “The ONES award has been truly instrumental, especially in building collaborations with other groups that we would not [otherwise] have had,” Shaw said. “These are the types of collaborations that help us ask bigger questions than we could have individually.”



*Block, who is a professor at Virginia Commonwealth University, presented the opening lecture showing how environmental toxins combine to cause a synergistic effect that she termed microglial priming. (Photo courtesy of Steve McCaw)*

### Addressing important topics in environmental health

The symposium kicked off with several talks on the mechanisms of toxicity. Former NIEHS postdoc Michelle Block, Ph.D., led off with some interesting studies that suggest a progression from environmental exposures, such as pesticides, to microglial activation, which in turn triggers the development of Parkinson’s disease. Slitt is studying the link between environmental exposures, nutrition, and genetics, and fat formation and weight loss. Luyendyk and Vishal Vaidya, Ph.D., are interested in how environmental toxins affect liver and kidney disease.

A major scientific theme was that environmental exposures, with potentially significant effects on human health, may occur *in utero* or, as Christy Porucznik, Ph.D., suggests, even before conception. Porucznik leads the Home Observation of Periconceptional Exposures study that monitors environmental exposures in couples trying to conceive. Metals and endocrine disrupting chemicals, such as flame retardants, were also discussed for their potential to impair the development of the fetus or to adversely affect an individual later in life.



*Stapleton, right, and Patisaul, center, listened as they waited for their turn to present. (Photo courtesy of Steve McCaw)*

In addition to numerous talks on the biological effects of exposure to various environmental toxicants, a set of awardees reported on new findings about repairing DNA damage. Telomeric and mitochondrial DNA repair and cope with DNA damage differently than does the nucleus, and several talks suggested that these differences may play a role in adverse effects on human health.

*Related stories:*

[Grantee explores the relationship between DNA damage and aging](#)

[Former NIEHS trainees return for ONES symposium](#)





*Dan Shaughnessy, Ph.D., listened to the talks from the Mutagenesis, Carcinogenesis, and DNA Repair part of the symposium that he moderated. Shaughnessy is a program administrator in the NIEHS Susceptibility and Population Health Branch. (Photo courtesy of Steve McCaw)*



*Elena Braithwaite, Ph.D., staff scientist in the NIEHS Comparative Genomics Group, supported her fellow environmental health scientists at the two-day symposium. (Photo courtesy of Steve McCaw)*



*Patricia Opresko, Ph.D., from the University of Pittsburgh, gave a talk about mechanisms for repair of ultraviolet damage on telomeres to avoid shortening of the ends of chromosomes. (Photo courtesy of Steve McCaw)*



*Porucznik is an assistant professor at the University of Utah and has an established record of leadership in prenatal health advocacy. (Photo courtesy of Steve McCaw)*



*Pierce, an epidemiologist from the University of Chicago, uses genomic data to find environmental risk factors in cancer. (Photo courtesy of Steve McCaw)*



## Birnbaum highlights accomplishments from ONES awardees

The addition of six new grants in 2011 brought the number of awardees to 42. Birnbaum had time to mention only some of the various exceptional honors and publications in her introduction.

- Aaron Bowman, Ph.D., of Vanderbilt University, was co-author of a publication in Nature titled “Opposing effects of polyglutamine expansion on native protein complexes contribute to SCA1.”
- Stapleton, of Duke University, received the Best Science Paper of 2011 in Environmental Science and Technology and was named Communication Fellow for Environmental Health News.
- Yu Chen, Ph.D., from the Langone Medical Center at New York University, and Brandon Pierce, Ph.D., of the University of Chicago, were co-authors of “Arsenic exposure from drinking water, and all-cause and chronic-disease mortalities in Bangladesh (HEALS): a prospective cohort study,” published in Lancet.
- Shaw, of Indiana University, who is currently an adjunct assistant professor at Mount Desert Island Biological Laboratory, published an article in Science in 2011 titled “The ecoresponsive genome of *Daphnia pulex*.”
- Jesus Araujo, M.D., Ph.D., of the University of California, Los Angeles, is a member of a scientific review panel on toxic air contaminants for the California Environmental Protection Agency.
- Joel Meyer, Ph.D., of Duke University, a former Superfund Research Program (SRP) Ph.D. trainee, is now a project leader in that program.
- Sarah Delaney, Ph.D., of Brown University, won the 2011 Philip J. Bray Award for Excellence in Undergraduate Teaching in the Physical Sciences.
- Rebecca Fry, Ph.D., project leader of an NIEHS SRP center, received this year’s Teaching Innovation Award from the University of North Carolina at Chapel Hill.
- Michelle Bell, Ph.D., of Yale University, received the Prince Albert II of Monaco/Institut Pasteur Award, for research on environmental changes and impacts on human health.
- Slitt won the 2012 Early Career Faculty Research Excellence Award in the Life Sciences, Physical Sciences, and Engineering from the University of Rhode Island.
- Donna Zhang, Ph.D., from the University of Arizona, received the Society of Toxicology 2012 Achievement Award.
- Jill Poole, M.D., received a 2011 New Investigator award from the University of Nebraska Medical Center.
- Jason Bielas, Ph.D., from the Fred Hutchinson Cancer Research Center and University of Washington School of Medicine, was elected as a councilor of the Environmental Mutagen Society.
- Brent Carter, M.D., of the University of Iowa, and John Hollingsworth, M.D., of Duke, were both recently elected to the American Society for Clinical Investigation. This honor recognizes the exceptional accomplishments of early-career physician-scientists.
- Stacey Harper, Ph.D., Oregon State University, was elected president of the Pacific Northwest Chapter of the Society of Toxicology.
- ONES awardees have filed for at least eight patents.

(Jeffrey Stumpf, Ph.D., is a research fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)

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# Mediating the body's clock and metabolism

By Robin Arnette

Over the past several years, researchers have discovered that disturbances to a person's natural 24-hour wake-sleep cycle impact the body's metabolism, and increase the risk of developing some cancers, diabetes, and obesity. Scientists have also found evidence that several nuclear receptors play a role in this control. Now, an NIEHS study provides more details on how everything fits together.

According to [Anton Jetten, Ph.D.](#), head of the NIEHS Laboratory of Respiratory Biology, obesity is an important risk factor for developing insulin resistance and type 2 diabetes. His team found that mice, which lack the genes for retinoic acid-related orphan receptor (ROR) alpha or ROR gamma, remain sensitive to insulin and are much less susceptible to type 2 diabetes.

The work also demonstrated that ROR receptors are involved in this association, by regulating clock and metabolic genes in 24-hour intervals. Part of this research appeared [online](#) June 29 in *Nucleic Acids Research* and reveals, for the first time, that ROR gamma, rather than ROR alpha, is the primary mediator between the body's clock and its regulation of metabolic genes.

Jetten and others have shown that RORs are not only targets for environmental chemicals and hormones, but also regulate an organism's [circadian rhythms](#), or the physiological changes that occur in response to light and darkness. He said these interactions are complex, but easy to understand if a person imagines himself or herself as ROR gamma. "When the alarm clock at home goes off in the morning, it tells you ROR gamma — to wake up and become active," Jetten explained. "As you start doing things around the house, like taking a shower or getting food out of the refrigerator, these actions are like the metabolic genes that ROR gamma acts upon."

## RORs are key to the connection

Japanese Society for the Promotion of Science Research Fellow in Biomedical and Behavioral Research at NIH Yukimasa Takeda, Ph.D., joined Jetten's group, because he was interested in this interplay. He used knockout mice — ROR alpha, ROR gamma, and double knockouts — to tease out the association. To measure the mice's circadian rhythms, Takeda collected tissue from several mice every 4-6 hours, and then analyzed changes in gene expression over a 24-hour period.

"Using microarray analysis, we were able to identify a number of metabolic genes, but we didn't know whether they were direct or indirect targets of RORs," Takeda said.



*Jetten explained the importance of RORs by saying, "Your physiology and metabolism are very different when you sleep than during the day or after you eat. The body constantly adjusts, and the central clock regulates this adjustment. RORs play a major role in everyday human life." (Photo courtesy of Steve McCaw)*



*Takeda is first author on the paper and sacrificed much of his own sleep generating this data. (Photo courtesy of Steve McCaw)*

That's when Jetten turned to ChIP-Seq, a powerful high-throughput method to map protein-DNA binding sites on a genome-wide scale. He submitted samples from the two knockout mice and generated an enormous amount of genomic data. At this point, Jetten needed the bioinformatics expertise of NIEHS colleague [Raja Jothi, Ph.D.](#), who accepted the challenge of analyzing the information.

After the analysis was complete, ChIP-Seq determined that ROR gamma bound to the regulatory region of several clock and metabolic genes, while ROR alpha either displayed much weaker binding or no binding at all. The results confirmed that these clock and metabolic genes were directly regulated by RORs, and that ROR gamma was more important in this regulation than ROR alpha. Prior to this work, many in the nuclear receptor community believed that ROR alpha was more important.

Jetten said, although he and his team know that disturbances in the circadian clock can promote obesity and diabetes, and that loss of ROR gamma can inhibit this susceptibility, understanding the exact mechanism of how ROR gamma does its job needs further study.

“For a scientist,” Jetten continued, “that’s what drives you — finding out how things work.”

*Citation:* [Takeda Y, Jothi R, Birault V, Jetten AM](#). 2012. ROR gamma directly regulates the circadian expression of clock genes and downstream targets in vivo. *Nucleic Acids Res*; doi:10.1093/nar/gks630 [Online 29 June 2012].

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## Former NIEHS trainees return for ONES symposium

*By Jeffrey Stumpf*

For several participants in the Outstanding New Environmental Scientist (ONES) Awardees Symposium July 10-11 ([see related story](#)), gathering at NIEHS also meant a visit to their postdoctoral alma mater.

Of the 27 ONES awardees presenting their research at the two-day symposium, all of whom are now lead researchers at other institutions, five were trained and mentored in the intramural research program at NIEHS ([see text box](#)).

Deputy Scientific Director William Schrader, Ph.D., who manages postdoctoral training at NIEHS, said he is proud of the successful track record of former NIEHS trainees in obtaining funding. “This success



*Jothi said that most of the data produced by ChIP-Seq weren't included in this paper, but he and Jetten are working on another manuscript that will examine the new genes they found. (Photo courtesy of Steve McCaw)*



*Regarding the ONES award, Block said, “I am truly humbled and honored to have received the award and continue to be both elated and grateful of the associated opportunities.” (Photo courtesy of Steve McCaw)*



shows how Division of Intramural Research trainees have moved on in their careers to focus upon important topics in environmental science,” Schrader stated. “These trainees have the background and insights needed to outline exciting aims and novel scientific approaches.”

### **NIEHS training credited with success**

The road from being a postdoctoral researcher to obtaining funding as a lead researcher is certainly an arduous one, and the former trainees credit NIEHS with paving the way to their future careers. Michelle Block, Ph.D., who gave the opening talk of the symposium, praised NIEHS for the experience of training with leading experts using extensive resources. “My time at NIEHS was truly a once-in-a-lifetime opportunity that determined who I am as a scientist,” Block recalled. “Postdocs are provided with a rare chance to push themselves and their abilities past what they ever believed they were capable of.”

Yu-Ying He, Ph.D., emphasized that the outstanding mentors at NIEHS, especially the late Colin Chignell, Ph.D., modeled how to mentor and research. “I had the opportunity to collaborate with outstanding environmental health scientists,” she added.

Scott McCulloch, Ph.D., echoed Yu-Ying He’s sentiments about the mentorship from a network of scientists with varying expertise. “There was someone with experience in answering nearly any question I may have had,” McCulloch said. “The ability to branch out from my comfort zone of knowledge and learn about fields and techniques way beyond my training was amazing.”

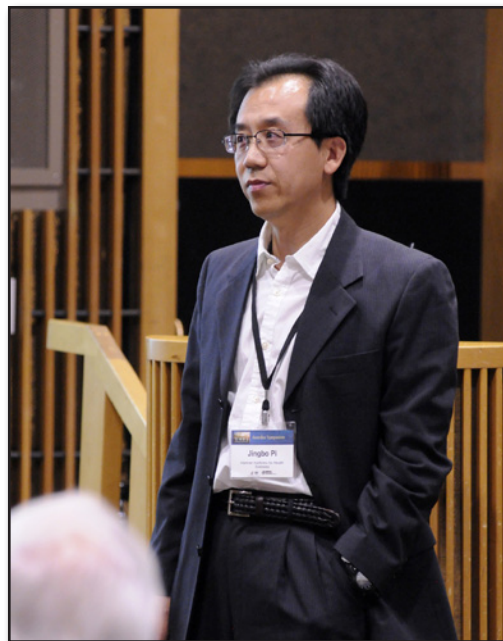
Career advancement programs are emphasized by the NIEHS training program and, as Block mentioned, grant writing courses primed her success in securing a Pathway to Independence and ONES award, along with her expertise in grant writing.

“In short, this is one of the many reasons that NIEHS always ranks so high in postdoc satisfaction surveys,” Block said.

### **Trainees transition to leaders**

The harsh reality of competition for funding causes many sleepless nights for any young scientist. The ONES program provided the opportunity to ease concerns of professors who are trying to make their lab competitive with more experienced researchers. In addition to providing funding for equipment and personnel, Block explained, the first big grant is incredibly important in launching a research program. “The ONES grant is a career-changing lifeline for new investigators.”

Besides boosting the careers of talented scientists, the success of the ONES program depends on the results of the research. McCulloch, who presented the final talk of the symposium, believes that his basic research in



*Pi is interested in understanding the influence of environmental stressors, such as arsenic, and health-related stresses, such as type 2 diabetes, on responses to oxidative stress in the cell. (Photo courtesy of Steve McCaw)*



*Meyer studies the fate of DNA damage that is not repaired in the mitochondrial genome and the effects of damaged mitochondrial DNA on human health. (Photo courtesy of Steve McCaw)*

polymerases that bypass DNA damage will have broad implications in environmental health. “We hope to better understand the role that pesticides, radiation, heavy metals, and other environmental exposures play in aging and carcinogenesis,” McCulloch predicted.

Joel Meyer, Ph.D., and Yu-Ying He are both interested on the effects of ultraviolet light-induced damage, and Yu-Ying He believes that this field of study will reveal new molecular bases for the development of preventive and therapeutic agents to reduce the skin cancer burden.

(Jeffrey Stumpf, Ph.D., is a research fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)

## Former trainees with ONES awards

- **Block**, of Virginia Commonwealth University, trained in the Neuropharmacology Group headed by [Jau-Shyong Hong, Ph.D.](#)
- **Jingbo Pi, M.D., Ph.D.**, of The Hamner Institutes for Health Sciences, worked as a special volunteer with NTP Laboratory head [Michael Waalkes, Ph.D.](#)
- **Meyer**, of Duke University, trained as a postdoctoral fellow in the DNA Repair and Mitochondrial Damage Group headed by Ben Van Houten, Ph.D., until 2008, and then as a special volunteer in the Mitochondrial DNA Replication Group headed by [William Copeland, Ph.D.](#)
- **Yu-Ying He**, of the University of Chicago, was a postdoctoral fellow in the Photosensitization Reactions Group headed by the Chignell and a special volunteer in the Free Radical Metabolism Group headed by [Ron Mason, Ph.D.](#)
- **McCulloch**, of North Carolina State University, trained in the DNA Replication Fidelity Group headed by [Thomas Kunkel, Ph.D.](#)

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*Yu-Ying He concluded her talk with simple advice on the best chance to avoid skin cancer — “Eat healthy, exercise, and don’t get too much sun.” (Photo courtesy of Steve McCaw)*



*McCulloch is grateful for receiving a ONES award and for the generous and much-needed support. (Photo courtesy of Steve McCaw)*



*Schrader said, “I am encouraged by the positive role being played by our trainees, as they move on into academic, private sector, and governmental science roles, where their past training at NIEHS can shine.” (Photo courtesy of Steve McCaw)*

# Comparative genomics researcher gains toxicology certification

*By Eddy Ball*

NIEHS staff scientist [Elena Braithwaite, Ph.D.](#), is the latest Institute scientist to meet requirements for Diplomate of the American Board of Toxicology (DABT) certification. With its rigorous professional standards, DABT certification often offers an advantage in the job market and career advancement, and has been associated with higher levels of compensation.

Braithwaite is a member of the Comparative Genomics Group headed by lead researcher [Jonathan Freedman, Ph.D.](#) She studies the mechanisms by which exposure to metals affect the transcription of specific genes and entire genomes, activate signal transduction cascades, and induce post-translational modification of metal-responsive transcription factors. The group uses a variety of model systems, including yeast, *C. elegans*, and mammalian cell culture.

The [American Board of Toxicology](#) was established in 1979 to advance standards in the field of toxicology and confer recognition upon those members of the profession who, measured against such standards, demonstrate competence. Certification requirements include a combination of education and experience, and a three-part examination.



*New diplomate Elena Braithwaite, Ph.D.  
(Photo courtesy of Veronica Godfrey Robinson)*

Several toxicologists at NIEHS and in NTP have qualified for the coveted DABT, among them NIEHS/NTP Director Linda Birnbaum, Ph.D., who is the first toxicologist to head the Institute. Birnbaum offered Braithwaite her sincere congratulations. “Welcome to the club!” she wrote. “This marks a very important milestone in your career.”

Diplomates hold initial DABT certification for 5 years, and must demonstrate that they actively practice toxicology, engage in continuing education, and maintain expert knowledge in their field prior to receiving recertification.

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# Nunnari delivers dynamic talk about mitochondrial biology

*By Jeffrey Stumpf*

University of California, Davis professor Jodi Nunnari, Ph.D., communicated her enthusiasm for mitochondrial biology in a captivating seminar June 25 at NIEHS.

Hosted by trainees as part of the Laboratory of Molecular Genetics (LMG) Fellows Invited Guest Lecture series, Nunnari wowed the audience with microscopy and crystallography data from her group’s exciting new discoveries in mitochondrial dynamics. Nunnari and her lab explore how the maintenance of mitochondrial DNA (mtDNA) affects mitochondrial dynamics and, ultimately, health and disease.



NIEHS has a long-standing interest in understanding genetic and environmental factors that alter mitochondrial behavior and impact cellular energy production. Containing small circular DNA nucleoids, mitochondria actively join and divide from other mitochondria, independent of the cell cycle, a process commonly called mitochondrial dynamics.

“Mitochondrial dynamics plays many different roles, ranging from the most fundamental role of distribution, to integration into signaling pathways and monitoring the status of cells,” Nunnari explained.

LMG trainee Matthew Young, Ph.D., hosted Nunnari’s visit and was impressed by how she used baker’s yeast to characterize components of mitochondrial machineries involving fusion and fission. “Her work has changed the way we think about mitochondria, from static jellybean-like organelles to an intracellular network that is moving, fusing, and dividing,” Young noted.

### **Mitochondrial dynamics culls the mtDNA herd**

Maintaining mtDNA is essential for translating the proper components of the electron transport chain on which human cells rely for ATP production. Mitochondria lack the myriad of DNA damage and mutation avoidance pathways employed by the nucleus and, instead, check the status of the mitochondrial genome using mitochondrial dynamics. Functional mitochondria maintain membrane potential required to drive the electron transport chain, and Nunnari suggested that the membrane potential acts as a gauge to determine the usefulness of mtDNA within the mitochondria.

“This is a quality control pathway where division is constantly questioning the functionality of the mitochondria, while fusion requires membrane potential,” Nunnari postulated. “If mitochondria lose membrane potential, they cannot rejoin and are forever banished from the herd.”

The ability of cells to identify and separate dysfunctional mitochondria is important in neurodegenerative diseases such as Parkinson’s. Two proteins directly linked to Parkinson’s, PINK-1 and Parkin, are important for the targeted destruction of depolarized, or nonfunctional, mitochondria. As Young remarked, the processes involving mitochondrial maintenance and removal appear to be important in understanding human health and disease.

“Mutations in two genes of the human mitochondrial fusion machinery, *MFN2* and *OPA1*, cause tissue-specific neurodegenerative disorders, Charcot-Marie-Tooth 2A and dominant optic atrophy,” Young added.



*Nunnari flavored her talk with humor, as she engaged the audience with her passion for studying mitochondria. She even quoted a 2010 opinion article that speculated, “Even aliens will need mitochondria.” (Photo courtesy of Steve McCaw)*



*Members of the audience studied Nunnari’s images of mitochondria in yeast cells. Shown, from left to right, are Dmitri Gordenin, Ph.D., Danielle Watt, Ph.D., Thomas Kunkel, Ph.D., Janine Santos, Ph.D., Tammy Collins, Ph.D., Libertad Garcia-Villada, Ph.D., and Andrew Passer. (Photo courtesy of Steve McCaw)*

## Picturing mitochondrial proteins in action

Nunnari presented a diverse set of techniques for understanding how mitochondrial fission is regulated. For example, Nunnari used colocalization of mutant variants to show that the dynamin-related protein Dnm1 and its mammalian homologue, Dyn1, functionally interact with the mitochondrial division proteins. To discover the biochemical defects of the mutant variants, Nunnari's lab solved the three-dimensional structure of Dyn1 and discovered important residues involving the self-assembly of the protein.

In an impressive array of microscopy images, Nunnari suggested a new player in mitochondrial division — the endoplasmic reticulum (ER). The high-resolution images showed that the ER crossed over at positions where mitochondrial division occurs more often. Further experiments identified what Nunnari referred to as ERMES, or ER-mitochondrion encounter structure, where several mitochondrial division proteins and the mtDNA nucleoid colocalized with ER-mediated proteins. The apparent logjam of important division proteins prompted Nunnari to quip, "It's getting crowded in there, isn't it?"

Like the rest of the audience, senior researchers were impressed by Nunnari's ground-breaking research. [William Copeland, Ph.D.](#), who leads the NIEHS Mitochondrial DNA Replication Group, acknowledged the significance of Nunnari's work in the field of mitochondrial biology. "Her current research changes not only how we view mitochondrial structure, but also communication and regulation between cellular components," he said.

(Jeffrey Stumpf, Ph.D., is a research fellow in the NIEHS Laboratory of Molecular Genetics Mitochondrial DNA Replication Group.)



*Young moderated questions after Nunnari's talk, with more than a passing interest in mitochondrial biology. As a postdoctoral fellow in the mitochondrial replication group, Young recently authored a paper characterizing mutations found in mitochondrial disease patients. (Photo courtesy of Steve McCaw)*



*Andrew Passer, an undergraduate summer student in the DNA Replication Fidelity Group, poses a question about Nunnari's crystallography data. (Photo courtesy of Steve McCaw)*



*Commenting on the presentation of her research, Copeland described Nunnari as "a pioneer in mitochondrial dynamics and structural organization." (Photo courtesy of Steve McCaw)*

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# Study examines the role of timing in breast cancer risk

By Bono Sen

A new [study](#), cofunded by NIEHS, suggests that women can significantly reduce their risk of breast cancer later in life by being physically active before or after menopause. The researchers analyzed data from women who had participated in the Long Island Breast Cancer Study Project.

In their study, University of North Carolina (UNC) at Chapel Hill epidemiologist Lauren McCullough, and colleagues from UNC, Columbia University, and Mount Sinai School of Medicine looked at the effects of physical activity, weight gain, and body size on breast cancer risk. Their findings, published online in *Cancer*, suggest that even a moderate level of physical activity can reduce a woman's risk of breast cancer, as long as there is no significant weight gain after menopause.

"Importantly, we found reduced risk of breast cancer for women who engaged in exercise after menopause," McCullough said in a [UNC press release](#). "This is particularly encouraging given the late age of onset for breast cancer."

## Greatest benefit from exercise during reproductive and postmenopausal years

That physical activity reduces the risk for breast cancer has been known for sometime. But before this information can be used to design effective public health intervention, several questions need to be addressed. For example, does the age at which activity is performed affect the benefit? How long and how often should women exercise? Is the benefit dependent on the intensity of the activity? Does an individual's weight affect the reduction in risk, and does exercise reduce the risk equally for all types of breast cancer? McCullough and colleagues designed their study to answer these very questions.

The researchers asked women with breast cancer (1504) and without breast cancer (1555), between the ages of 20 and 98, about their level of physical activity. They found that women who exercised up to two hours each day during their reproductive and postmenopausal years had a 30 percent reduced risk of breast cancer. The reduction in risk was observed irrespective of the intensity of the activity.

Additionally, exercise also reduced the risk of hormone receptor (HR) positive breast cancers by 25 percent, an important observation given that HR positive breast cancer is the more prevalent form of the disease among American women and is on the rise.

## Genetics and weight gain also affect risk

Importantly, the researchers noted that women who were moderately active experienced a greater reduction in risk than women at the highest levels of physical activity, suggesting that underlying biologic or genetic characteristics related to exercise physiology may be responsible for this non-linear association and warrants additional investigation. Activity performed during adolescence or early adulthood did not affect a woman's breast cancer risk, suggesting that the timing of physical activity was important in reducing risk.



*When asked what recommendations she would give to women about physical activity, McCullough said emphatically, "I believe that all women, irrespective of body size, should engage in some activity." (Photo courtesy of Lauren McCullough)*



When evaluating the three-way effects of weight gain, body mass index, and physical activity, the researchers found that even high levels of physical activity were not sufficient to eliminate the excess breast cancer risk caused by weight gain.

These findings have the potential to inform interventions to reduce breast cancer risk. However, given that the study cohort consisted of a homogenous population of mostly affluent and educated women, further studies will need to be conducted in diverse populations before these results are applicable to a wider population.

In addition to NIEHS funding, awards from the U.S. Department of Defense Breast Cancer Research Program and the National Cancer Institute provided support for the research.

*Citation:* [McCullough LE, Eng SM, Bradshaw PT, Cleveland RJ, Teitelbaum SL, Neugut AI, Gammon MD. 2012. Fat or fit: The joint effects of physical activity, weight gain, and body size on breast cancer risk. Cancer; doi:10.1002/cncr.27433 \[online 25 June 2012\].](#)

(Bono Sen, Ph.D., is the science education and outreach program manager for the NIEHS journal Environmental Health Perspectives.)

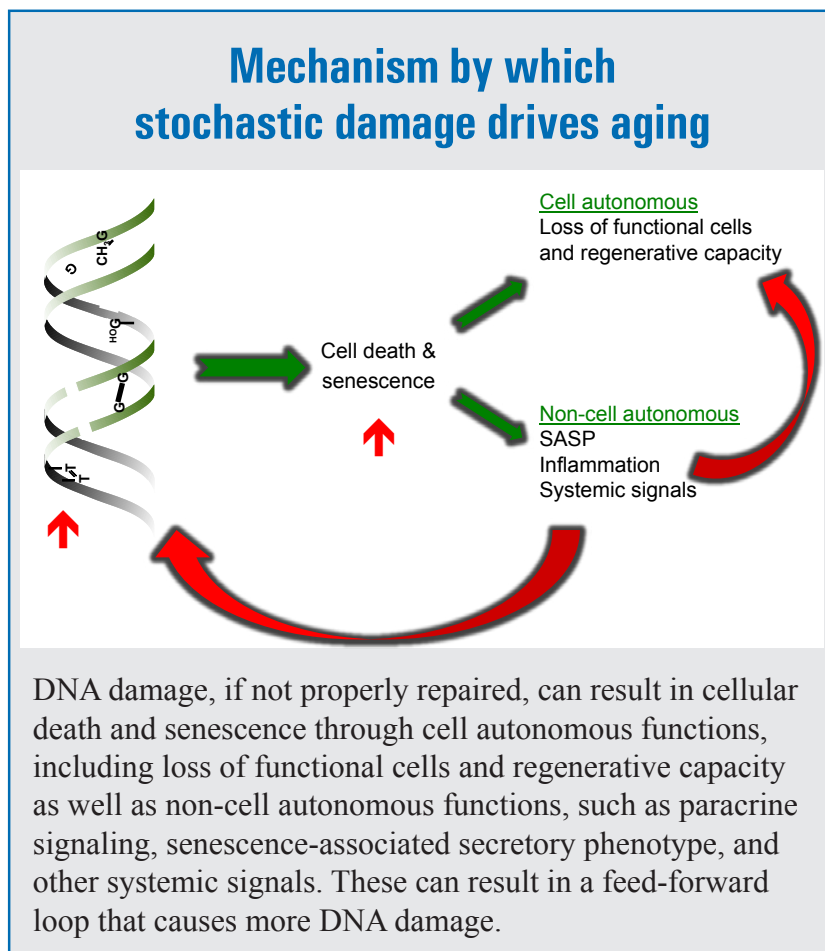
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## Grantee explores the relationship between DNA damage and aging

By John House

At first look, aging seems to be genetically programmed. Babies look the same and share common features that change in concert between individuals as they age, and the disparate life spans of different species clearly points to a strong genetic component. But a new way of looking at the genetic component in aging suggests the process may be much less programmed than shaped by a time-dependent accumulation of damage to mitochondria, lamins, DNA, RNA, and proteins, with an important part of the damage driven by environmental exposures.

Grantee [Laura Niedernhofer, M.D., Ph.D.](#), finds her passion in attempting to answer the burning questions of what types of DNA damage cause aging and through what mechanisms. Her talk at NIEHS July12 presented recent work she has conducted with [NIEHS support](#). She expressed her gratitude for her grant by saying, “I’m just proud to be funded by NIEHS.”



## Studying defects in DNA repair with a partial knockout model

Niedernhofer noted that many diseases associated with genome instability caused by a DNA repair defect, such as ataxia telangiectasia, also known as Louis-Bar syndrome, Cockayne syndrome, and Werner syndrome, lead to premature aging or a cancer phenotype. Furthermore, approximately two percent of the genome is dedicated to repair of DNA damage, which makes sense given that humans are continually exposed to genotoxins from exogenous sources such as ultraviolet light and X-rays, as well as endogenous sources from metabolism and its production of radical oxygen species.

As Niedernhofer explained, work in the 1980s demonstrated the importance of the human DNA repair gene *ERCC1* and subsequent work showed that ERCC1 forms a complex with XPF to assist with multiple types of DNA repair. Strikingly, mutations in *XPF* can cause premature aging or progeria, characterized by muscle wasting, osteoporosis, anemia, and neurodegeneration, among other degenerative changes.

*Ercc1* knockout, (*Ercc1*(-/-)), mice exhibit severe neurodegeneration and dystonia and die within four weeks of birth. In order to study the role unrepaired DNA damage plays in aging, Niedernhofer created partial knockout (*Ercc1*(-/ $\Delta$ )) mice that make around five percent as much of the ERCC1-XPF complex as wild-type animals. By the time these mice reach 25 weeks of age, they exhibit the physical characteristics seen in three-year-old wild-type mice and spontaneously develop cerebral atrophy, osteoporosis, thin skin, and other characteristics of the XPF progeroid syndrome, all from a defect in the ability to repair DNA damage.

## Through what mechanism(s) does DNA damage promote aging?

Having shown ERCC1-XPF insufficiency in mice causes progeroid syndrome, as it does in humans, Niedernhofer is currently determining the mechanism(s) by which unrepaired DNA damage in *Ercc1*(-/ $\Delta$ ) mice drives premature aging. Her group determined oxidative DNA damage resulting in cyclopurine adducts was increased in tissues of *Ercc1*(-/ $\Delta$ ) mice compared to controls. To test the hypothesis that these DNA lesions were caused by mitochondrial-produced ROS, *Ercc1*(-/ $\Delta$ ) mice were chronically treated with a mitochondrial-targeted radical scavenger (XJB-5-131). Remarkably, this resulted in reduced cyclopurine adducts and delayed progeroid symptoms in the mice.



*Niedernhofer's talk offered a more detailed look at new findings she presented the previous day at the annual meeting of Outstanding New Environmental Scientist (ONES) awardees. Her research in aging has yielded important biomarkers of biological aging, given key insight into mechanisms of aging, and hinted at therapeutic approaches to delay the onset of aging. (Photo courtesy of Steve McCaw)*



*The talk drew a capacity crowd of NIEHS scientists, including some of the top researchers in the Laboratory of Molecular Genetics and Laboratory of Structural Biology. NIEHS Health Science Administrator [Kimberly McAllister, Ph.D.](#), was host for the talk. (Photo courtesy of Steve McCaw)*



Different tissues responded differently to DNA repair deficiency. In *Ercc1*(-/ $\Delta$ ) mice, neurons were particularly vulnerable to lack of *Ercc1* and exhibited death; liver cells senesced, as shown by loss of regenerative ability in mice after partial hepatectomy, while the hematopoietic system suffered increased turnover and loss of the stem cell pool in BrdU labeling experiments.

Niedernhofer noted these responses pointed to cell autonomous responses to DNA damage left unrepaired in *Ercc1*(-/ $\Delta$ ) mice. To examine non-cell autonomous responses to DNA damage, she next turned her attention to nuclear factor-kappa beta (NF- $\kappa$ B). NF- $\kappa$ B is a transcription factor with multiple roles in cell signaling in response to damage.

Prior work by other groups had already implicated NF- $\kappa$ B in senescence and aging. NF- $\kappa$ B is upregulated in aged tissues and suppression of NF- $\kappa$ B in mouse reversed aging of skin. Nearly every tissue examined in *Ercc1*(-/ $\Delta$ ) mice had increased NF- $\kappa$ B activity. Moreover, inhibition of NF- $\kappa$ B in *Ercc1*(-/ $\Delta$ ) mice delayed onset of progeroid aging and reduced DNA damage. This and additional experiments suggest NF- $\kappa$ B signaling causes cellular responses that result in a feed-forward loop of cellular stress and additional DNA damage.

(John House, Ph.D., is a postdoctoral fellow in the NIEHS Lung Respiratory Biology Group.)

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## NIEHS summer interns learn from experience, and the experienced

*By Ian Thomas*

Expectations were high, as dozens of students gathered in Rodbell Auditorium for a series of seminars to complement their lab work in the [NIH Summer Internship Program \(SIP\) at NIEHS](#), which is headed by coordinator Debbie Wilson of the Institute's Office of the Scientific Director. In the course of eight weeks at NIEHS, the interns spend time at the bench and engaged in seminars designed and coordinated by a dedicated group of the Institute's postdoctoral fellows ([see text box](#)).

“Being a part of this program is an incredible opportunity, because of the experience it allows you to garner,” said Spencer Nelson, an environmental science major at the University of North Carolina at Chapel Hill (UNC) and an intern in the Laboratory of Respiratory Biology [Environmental Genetics Group](#). “So many of my friends back on campus are stuck in offices, doing menial tasks and assignments, but here I get to make contributions and be a part of the research every day.”

A key component of SIP is its commitment to giving students actual, hands-on experience in a world-class biomedical research setting. Through mentor-style partnerships with members of the intramural research team, NIEHS strives to teach its interns, first-hand, what it means to conduct experiments and analyze data.



*As the expression on the face of Julia Zhang indicates, at its best, the summer learning experience is not only fulfilling, but fun. Zhang is an intern in the Biostatistics Branch. (Photo courtesy of Steve McCaw)*

## A diverse environment of learning

In addition to their time in the lab, students also participate in a series of educational seminars, designed to expose them to a wide range of scientific disciplines, from cancer research to bioinformatics. The format of seminars ranged widely, as well, from formal lectures and group presentations, to hands-on activities.

The “Mutagenesis” seminar, spearheaded by Nisha Cavanaugh, Ph.D., Stela Palii, Ph.D., and Sarah Swerdlow, Ph.D., created a context for the importance of molecular genetics research, by presenting the effects of mutations and the environment on human diseases. Invited speakers from the Laboratory of Molecular Genetics – Shay Covo, Ph.D., Jeffrey Stumpf, Ph.D., and Jessica Williams, Ph.D. – walked the students through a typical experiment in each of their research projects and instructed them on how to interpret the data. Finally, students’ understanding of the presentations was assessed, with a rousing game of Genetics Jeopardy. “Our internship program is about teaching these students how to perform and interpret professional level experiments,” said [Jeffrey Stumpf, Ph.D.](#) “With that goal in mind, we wanted to get students engaged in what we were saying and put them in a position to think interrogatively as scientists.”

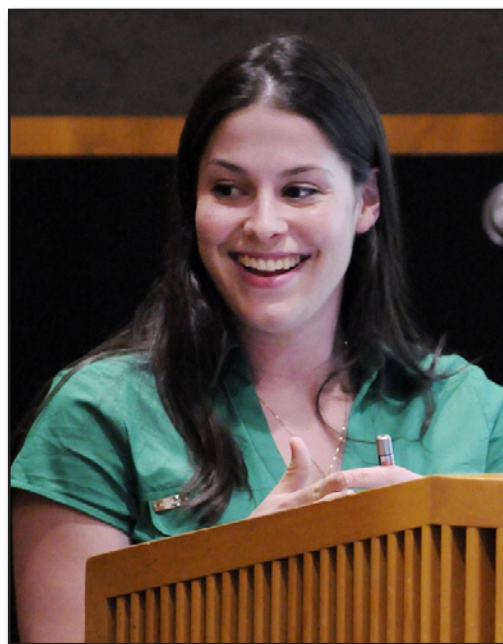
Ashley Godfrey, Ph.D., and Kirsten Verhein, Ph.D., offered a more conventional lecture style for the second seminar presented by NIEHS toxicologist [Mike DeVito, Ph.D.](#), titled “Protective Mechanisms in Toxicology: Metabolism.”

The third seminar, organized by Qing Cheng, Ph.D., and Kristin Lichti-Kaiser, Ph.D., focused on immune response to environmental challenges. [Donald Cook, Ph.D.](#), from the Laboratory of Respiratory Biology, taught students about immune response in the lungs after exposure to environmental agents and allergens. Seddon Thomas, Ph.D., and Bethany Hsia, Ph.D., also led an activity designed to introduce the students to their research, by guiding them through some methods and using microscopes to examine lung inflammation from samples.

## Beyond the Institute

As the summer wound to a close with the annual SIP poster session, where students present projects showcasing what they’ve learned during their time in the program, many interns admitted that, while they entered this experience confident in their love of science, their time at NIEHS has expanded their view of the field.

“This is my second year in the program and it’s been an enormous learning experience for me,” said Fei-Lin Scruggs, a recent high school graduate who studies DNA repair in the Laboratory of Structural Biology [DNA Repair and Nucleic Acid Enzymology Group](#). “I’ll begin my freshman year of college this fall and, while I always knew I wanted to study science, my experience here at NIEHS has taught me what it means to be an actual researcher.”



*Swerdlow led off the lineup of postdocs who took students through basics of genetics and DNA repair. (Photo courtesy of Steve McCaw)*



*Stumpf, right, and Cavanaugh listened to Swerdlow, as they waited their turn to present. (Photo courtesy of Steve McCaw)*





*DeVito drew upon his experience in regulatory science at the U.S. Environmental Protection Agency and in toxicology at NIEHS, in his overview of classical toxicology and the emerging paradigm of predictive toxicology using high-throughput screening. (Photo courtesy of Steve McCaw)*



*Cook's presentation on inflammatory response moved smoothly into a hands-on exercise at microscopes. (Photo courtesy of Steve McCaw)*



*Intern Yasmin Crespo-Mejias traveled from Puerto Rico this summer to spend her second year as an intern with the Reproductive Developmental Biology Group. (Photo courtesy of Steve McCaw)*



*As an intern in the DNA Replication Fidelity Group, Andrew Passler took naturally to the microscope exercise. (Photo courtesy of Steve McCaw)*



*North Carolina State University student Paul Gibson is spending his summer working with Division of Extramural Research and Training Health Scientist Administrator Jerry Heindel, Ph.D., and Health Scientist Thad Schug, Ph.D. (Photo courtesy of Steve McCaw)*

## Postdocs tailor training for summer interns

A group of NIEHS postdoctoral fellows spearheaded the design, coordination, and implementation of the 2012 SIP seminar series.

This summer's workshops included:

### **“Mutagenesis and Maintenance of Genome Integrity”**

#### **Organizers:**

Sarah Swerdlow, Ph.D., Mechanisms of Mutation Group  
Stela Palii, Ph.D., Environmental Stress and Cancer Group  
Nisha Cavanaugh, Ph.D., DNA Repair and Nucleic Acid Enzymology Group

#### **Guest Speakers:**

Sarah Swerdlow, Ph.D., Mechanisms of Mutation Group  
Shay Covo, Ph.D., Chromosome Stability Group  
Jeffrey Stumpf, Ph.D., Mitochondrial DNA Replication Group  
Jessica Williams, Ph.D., DNA Replication Fidelity Group

### **“Protective Mechanisms in Toxicology: Metabolism”**

#### **Organizers:**

Ashley Godfrey, Ph.D., Molecular and Genetic Epidemiology Group  
Kirsten Verhein, Ph.D., Environmental Genetics Group

#### **Guest Speaker:**

Mike DeVito, Ph.D., Experimental Toxicology Group

### **“DEE-fense! Immune Responses to Environmental Challenge”**

#### **Organizers:**

Qing Cheng, Ph.D., Ion Channel Physiology Group  
Kirsten Lichti-Kaiser, Ph.D., Cell Biology Group.

#### **Guest Speakers:**

Donald Cook, Ph.D.  
Seddon Thomas  
Bethany Hsia, Ph.D.  
All from the Immunogenetics Group

(Ian Thomas is a public affairs specialist with the NIEHS Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

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# Research team uncovers a new cellular stress response mechanism

By Melissa Kerr

In a recently published [study](#), a team of NIEHS-funded researchers applied innovative technologies to discover a step-wise process in the mechanisms of cell defense against toxic chemicals. They report that when introduced into a stress-inducing environment, the cell attempts to fortify its defenses by modifying a unique program that drives the makeup of its proteins. The findings appeared in the July 3 issue of Nature Communications.

Lead researcher on the team, [Peter Dedon, M.D., Ph.D.](#), is a professor of toxicology and biological engineering at the Massachusetts Institute of Technology (MIT). The team included first author Clement Chan, Ph.D., of MIT, and 2006 NIEHS Outstanding New Environmental Scientist awardee [Thomas Begley, Ph.D.](#), a cancer biologist at the College of Nanoscale Science and Engineering (CNSE) at the University at Albany, along with colleagues from MIT and CNSE.

Dedon and Begley's research team has focused on RNA mechanisms that control protein expression within a cell. By delineating the mechanisms of cellular response to stress, the team's research advances understanding of potential targets for attenuating the damaging effects that toxicants and other stressors may have on a cell.

"If you understand the mechanism, then you can design interventions," Dedon explained. "For example, what if we develop ways to block or interrupt the toxic effects of the chronic inflammation?" Inflammation has been implicated in aging and a range of diseases, including cancer.

## Protein factory

Proteins are major players within a cell, and the amino acids that make up proteins are specified by the information encoded within a cell's genes. The process of building proteins, called translation, occurs in the ribosome and consists of transfer ribonucleic acids (tRNA) binding to messenger RNA (mRNA).

Each tRNA carries a particular amino acid, which corresponds to one or more three-base sequences on the mRNA called codons. Other translational enzymes string the amino acids together to make a protein. A key to the research team's latest work is that different codons for an amino acid are not used equally, with emergency response genes containing biased distributions of specific codons.



*Dedon heads an MIT research group whose work addresses the role of RNA secondary modifications in the cellular responses to toxic exposures. He is also a member of the infectious diseases interdisciplinary research group in the [Singapore-MIT Alliance for Research and Technology](#), which helped fund the study. (Photo courtesy of Peter Dedon)*



*Asked about the follow up to this study, Begley said that there are more than 35 tRNA modification enzymes in humans, and discovering their roles will bring researchers closer to understanding their functions in signaling and disease. (Photo courtesy of Thomas Begley)*

## Genetic emergency response

The team has now discovered that cells coordinate codon biases in genes with changes in tRNA structure, to adapt the construction of proteins needed for a cell to defend against toxic exposures. Dedon explained, “In the end, a stepwise mechanism leads to selective expression of proteins that you need to survive.”

In earlier work reported in 2010, the team exposed yeast cells to different toxic chemicals, including bleach and hydrogen peroxide, both made by human immune cells. They described a cellular response in which a set of two-dozen tRNA structural modifications reprogram following toxicant exposure. They also found that if the cell did not have the ability to change the tRNA modifications, it would not be able to defend itself. This new study built on those findings by focusing on oxidative stress caused by hydrogen peroxide and a specific tRNA modification called m<sup>5</sup>C (see text box).

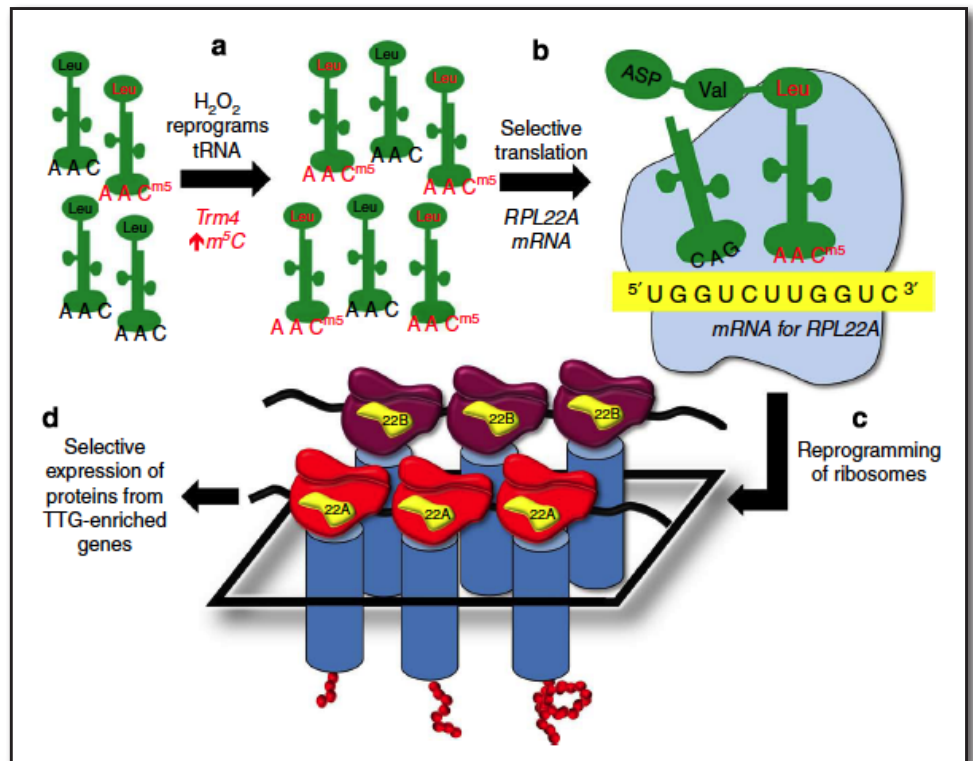
Dedon’s and Begley’s team has found that there are particular patterns of tRNA modification that are markers for toxicant exposure and this may match patterns of codon distribution in groups of genes needed to respond to each toxicant. The authors concluded the paper by writing, “The variety of RNA modifications in the tRNA...suggest[s] a mechanism capable of fine tuning the translational response to virtually any cell stimulus.”

## An emergency response to oxidative stress

The tRNA carries a three-letter genetic code on one end, called the anticodon. These anticodons match with a corresponding codon on the mRNA.

The study by the Dedon-Begley team focuses on a particular tRNA modification called m<sup>5</sup>C, which is found on the first letter of the anticodon portion of the leucine tRNA that pairs with the TTG codon in genes. The researchers found that when cells are exposed to hydrogen peroxide, the level of m<sup>5</sup>C on the tRNA increases, which leads to increased translation of TTG-enriched genes into proteins. This reprogramming of tRNA spurs the cell to change the structure of the protein-assembling ribosome machinery in a way that generates critical proteins to counter the damage produced by hydrogen peroxide.

“You need this sort of emergency ribosome response to make the critical proteins,” Dedon said.



### Proposed mechanism by which increase in m<sup>5</sup>C level regulates translation of ribosomal protein paralogues and confers resistance to hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>).

Exposure to H<sub>2</sub>O<sub>2</sub> leads to an elevation in the level of m<sup>5</sup>C at the wobble position of the leucine tRNA for translating the codon UUG on mRNA (a), which enhances the translation of the UUG-enriched RPL22A mRNA relative to its paralogue RPL22B (b) and leads to changes in ribosome composition (c). This reprogramming of tRNA and ribosomes ultimately causes selective translation of proteins from genes enriched with the codon TTG (d). (Courtesy of Peter Dedon, this graphic was first published in *Nature Communications*.)



The researchers plan to expand their studies of tRNA. If there were some way to control the reprogramming of these tRNA modifications, it could enhance cellular survival. The team also plans to investigate the mechanisms of cancer development in more detail, since certain tRNA-modifying proteins appear to control tumor growth.

#### *Citations:*

Chan CT, Dyavaiah M, DeMott MS, Taghizadeh K, Dedon PC, Begley TJ. 2010. A quantitative systems approach reveals dynamic control of tRNA modifications during cellular stress. *PLoS Genet* 6(12):e1001247.

Chan CT, Pang YL, Deng W, Babu IR, Dyavaiah M, Begley TJ, Dedon PC. 2012. Reprogramming of tRNA modifications controls the oxidative stress response by codon-biased translation of proteins. *Nat Commun* 3:937.

(Melissa Kerr studies chemistry at North Carolina Central University. She is currently an intern in the NIEHS Office of Communications and Public Liaison.)

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## **New approach to alleviate chronic pain in diabetic patients**

*By Brant Hamel*

A new study funded by the NIEHS Superfund Research Program describes a novel mechanism for treating the chronic neuropathic pain associated with diabetes. More than 23 million Americans suffer from diabetes and their consistently high glucose levels damage nerves leading to chronic pain and other issues.

Current pain treatments, such as analgesics, suffer from lack of efficacy for neuropathic pain or, in the case of narcotics, dangerous side effects, such as addiction. The current [study](#), published in the July 10 issue of the *Proceedings of the National Academy of Sciences*, found that inhibition of soluble epoxide hydrolase (sEH) results in the increase of natural fatty acids, with anti-inflammatory effects, that reduce sensations of pain in an animal model of type I diabetes.

Leading the research team was veteran NIEHS grantee [Bruce Hammock, Ph.D.](#), a distinguished professor of entomology at the University of California (UC), Davis and a member of the UC Davis Comprehensive Cancer Center. Among his many honors was his election to the National Academy of Sciences in 1999.

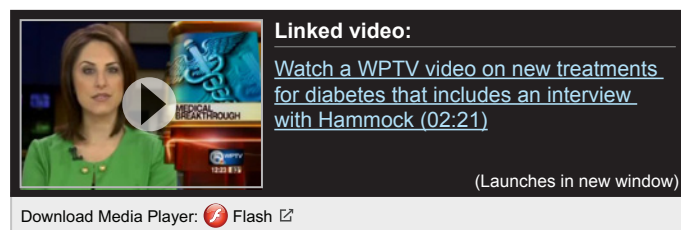
“Our data indicate that this drug candidate is more effective for neuropathic pain caused by diabetes than any of the prescription drugs now on the market,” Hammock was quoted as saying in a [press release](#) about the findings.



*Hammock directs the Superfund Research and Training Program, NIH Training Program in Biotechnology, and NIEHS Combined Analytical Laboratory at UC Davis, where he has performed extensive research into applications of metabolomics methodologies. (Photo courtesy of UC Davis)*

## Blocking inflammation and pain by regulating fatty acid metabolism

Previous work by Hammock has led to the creation of multiple start-up companies, including one focused on the anti-inflammatory effects of sEH inhibitors to control blood pressure ([see story](#)). His current work focuses on another property of this class of compounds — the ability to increase epoxygenated fatty acids in the body that appear to selectively block pain sensations in a rat model of diabetes.



Hammock's approach to treating the neuropathic pain associated with diabetes was to inhibit sEH, the enzyme that degrades epoxygenated fatty acids. This led to an increase in epoxygenated fatty acids that reduced pain through, as yet, unknown mechanisms. Multiple inhibitors were tested and one compound, 1-(1-methylsulfonyl-piperidin-4-yl)-3-(4-trifluoromethoxy-phenyl)-urea (TUPS), was found to be more efficacious than a ten-fold higher dose of the widely prescribed therapeutic gabapentin.

TUPS has been engineered to have more drug-like characteristics than previous generations of inhibitors, including increased solubility and bioavailability. In tests of its efficacy, the compound was able to reduce pain over a prolonged 4-day period, compared to daily doses needed for current treatments.

In addition, as the drug works to increase the level of a natural biological pain modulator, there may be decreased side effects compared to current treatments. The TUPS treatments did not affect the glycemic status or insulin response of the animals and appeared to selectively decrease pain sensations. There also did not appear to be any side effects related to sensorimotor functions of the rats, as is commonly seen with narcotic drugs.

“Although it is not clear if sEH inhibitors will be efficacious in human patients, our findings in rodent models suggest that inhibition of sEH may become a viable strategy to prevent and alleviate neuropathic pain in diabetes patients,” the team concluded.

The study's findings have their roots in much earlier work by the UC Davis Superfund Research Program on insect control through regulating insect larvae. [Hammock's laboratory](#) pioneered the use of transition-state theory to inhibit enzymes with small molecules and recombinant viruses as green pesticides, as well as the use of immunochemistry for pesticide analysis.

*Citation:* Inceoglu B, Wagner KM, Yang J, Bettaieb A, Schebb NH, Hwang SH, Morisseau C, Haj FG, Hammock BD. 2012. Acute augmentation of epoxygenated fatty acid levels rapidly reduces pain-related behavior in a rat model of type I diabetes. *Proc Natl Acad Sci* 109(28):11390-11395.

(Brant Hamel, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Molecular Endocrinology Group of the Laboratory of Signal Transduction.)

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# This month in EHP

This month's feature stories in [Environmental Health Perspectives \(EHP\)](#) tackle the timely issues of ultraviolet radiation exposure and emotion-based judgments about science.

## Focus — UV Radiation and Skin Cancer: The Science Behind Age Restrictions for Tanning Beds

Every year, millions of people climb, in various states of undress, into warm, glowing tanning beds, where, during a typical 2- to 15-minute session, they absorb a controlled dose of ultraviolet (UV) radiation at an intensity of up to two to three times stronger than the sunlight striking the equator at noon. A body of evidence suggesting that UV overexposure, at a young age, plays a key role in developing skin cancer, has prompted 33 U.S. states and some municipalities to restrict indoor tanning among children under age 18.

## Spheres of Influence — Flavors of Uncertainty: The Difference Between Denial and Debate

During the pilot episode of Comedy Central's late night TV show "The Colbert Report," satirist Stephen Colbert coined the term truthiness — truths that feel right, regardless of evidence or reason. Using satire, Colbert captured the essence of an issue that has many people deeply concerned — the denial of scientific evidence on the basis of gut-level emotions.

## Podcast — Migration and Climate Change, with Jon Barnett and Celia McMichael

Over the past million years, migrations have happened because of food shortages, droughts, ice ages, and many other climate-related reasons. But, for the first time in our history, human beings are migrating because of climate change, for which we, ourselves, are partly responsible. In this month's [Researcher's Perspective](#) podcast, Celia McMichael, Ph.D., and Jon Barnett, Ph.D., discuss climate-related migration in the present day and the way it may look in the future.

Featured commentaries, reviews, and research this month include:

- Short-term Associations of PM<sub>2.5</sub> Constituents and Hospitalizations
- Selective Pressure of Antibiotic Pollution on Bacteria Important to Public Health
- Human Neural Crest Cell Migration Assay for Developmental Toxicants
- DEHP, Adipogenesis, and Fertility in Mice

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<http://twitter.com/ehponline>





# Upcoming workshop on human genomic plasticity

By Eddy Ball

An innovative interagency program continues its 2012 workshop series with an exploration of “Exploring Human Genomic Plasticity and Environmental Stressors: Emerging Evidence on Telomeres, Copy Number Variation, and Transposons” Oct. 4-5 in Washington, D.C.



The workshop, which is part of the National Academies Emerging Science for Environmental Health Decisions series, is free and open to the public. [Registrations](#) for onsite attendance are now being accepted and webcast registration will soon be available.


## Genomic plasticity triggered by environmental exposures

Genomes have the characteristic of plasticity, which makes it possible to adapt quickly in order to survive changes in environmental conditions. Along with epigenetic modifications, mobile and evolving elements, such as telomeres, transposons, and copy number variants, are important factors in understanding the potential effect of our environment on human health.

The genomic plasticity forum will look beyond random mutation and discuss the fundamental changes in genomic alterations that can contribute to disease and aging, as well as new technologies and tools to identify and study genome plasticity events. Confirmed speakers include NIEHS grantees Kenneth Ramos, Ph.D., and Joseph Shaw, Ph.D., as well as David Gilley, Ph.D., John Moran, Ph.D., and Thea Tisty, Ph.D.

Sponsored by NIEHS, the program holds three workshops per year on the use of new discoveries, tools, and approaches for guiding environmental health decisions. The workshops provide a public venue for communication among government, industry, environmental groups, and the academic community.



The October workshop is the twelfth in the [series](#), which began in July 2009 with a workshop on “Use of Emerging Science and Technologies to Explore Epigenetic Mechanisms Underlying the Developmental Basis for Disease.” Past presentations are archived online, and videos are available for several recent workshops.



**Linked video:**

[Register to watch the archived webcast videos of the June 14-15 workshop on Systems Biology — Informed Risk Assessment](#)

(Launches in new window)

Download Media Player:  Flash 

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# Extramural papers of the month

By *Nancy Lamontagne*

- [Naphthalene exposure in children](#)
- [Inhalation of nanoparticles from cosmetics](#)
- [Transgenerational effects from BPA exposure](#)
- [Prenatal butylbenzyl phthalate and eczema](#)



Read the current Superfund Research Program [Research Brief](#). New issues are published on the first Wednesday of each month.

## Naphthalene exposure in children

NIEHS grantees report that children exposed to high levels of naphthalene have a greater risk of chromosomal abnormalities, which have been associated with increased cancer risk in adults. Naphthalene is a polycyclic aromatic hydrocarbon found in automotive exhaust, tobacco smoke, and household mothball fumes.

The researchers followed 113 5-year-olds living in New York City and assessed the children's exposure to naphthalene, by measuring its metabolites, 1- and 2-naphthol, in urine. They also measured chromosomal abnormalities in the children's white blood cells.

The researchers found chromosomal abnormalities in 30 children, of which 11 had a type of abnormality known as a translocation. With every doubling of 1- and 2-naphthol levels, translocations were 1.55 and 1.92 times more likely, respectively. The researchers say that translocations can remain years after exposure, even though the body repairs some chromosomal damage. The researchers are now following some of the children through fourth grade, to better understand the long-term effects of naphthalene exposure.

*Citation:* [Orjuela MA, Liu X, Miller RL, Warburton D, Tang D, Jobanputra V, Hoepner L, Suen IH, Diaz-Carreño S, Li Z, Sjodin A, Perera F. 2012. Urinary naphthol metabolites and chromosomal aberrations in 5-year-old children. Cancer Epidemiol Biomarkers Prev 21\(7\):1191-1202.](#)

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## Inhalation of nanoparticles from cosmetics

Nanoparticles from cosmetic powders can be inhaled and deposited in the upper airways, according to a new study from NIEHS-funded researchers. Although studies have looked at the toxicology of pure nanomaterials, very few have examined exposure during actual use of products containing nanomaterials.

The researchers studied six cosmetic powders, three of which were identified by the manufacturer as containing nanoparticles. Analysis, with transmission electron microscopy and laser diffraction spectroscopy, revealed that five of the six products contained nanoparticles. The investigators simulated exposure to the powders by applying them to a mannequin's face while sampling airborne particles through ports in the mannequin's nostrils.

The study results showed that someone using these cosmetic powders would be exposed to nanomaterials that were mostly clustered into agglomerates, or attached to larger particles. In this form, the nanomaterials would

deposit in the upper airways, rather than the alveolar region of the lung, as would be expected from the size of the primary nanoparticles. Upper airway deposition could lead to different health effects than those found in nanoparticle toxicology studies for the alveolar region.

*Citation:* [Nazarenko Y, Zhen H, Han T, Liroy PJ, Mainelis G](#). 2012. Potential for inhalation exposure to engineered nanoparticles from nanotechnology-based cosmetic powders. *Environ Health Perspect* 120(6):885-892.

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## Transgenerational effects from BPA exposure

An NIEHS grantee and her colleagues report that mice exposed to low doses of bisphenol A (BPA) while in the womb had immediate, as well as long-lasting, changes in the brain and social behaviors. Some of these changes persisted into the fourth generation. The researchers say that their findings have implications for complex neurological disease.

In the study, female mice received chow with or without BPA, before mating and throughout pregnancy. The levels of BPA present in the blood plasma of the female mice that received BPA were in a range similar to those measured in humans who were exposed to BPA.

The first generation offspring, which were exposed to BPA in the womb, displayed fewer social interactions compared to control mice. The researchers also found that BPA had an effect on the levels of the mRNA levels of neuropeptides vasopressin and oxytocin, which are both involved in social behaviors. Decreases in vasopressin levels were observed all the way through the fourth generation offspring.

*Citation:* [Wolstenholme JT, Edwards M, Shetty SR, Gatewood JD, Taylor JA, Rissman EF, Connelly JJ](#). 2012. Gestational exposure to bisphenol A produces transgenerational changes in behaviors and gene expression. *Endocrinology* 153(8):3828-3838.

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## Prenatal butylbenzyl phthalate and eczema

An NIEHS-funded study shows that prenatal exposure to butylbenzyl phthalate (BBzP) can increase a child's risk for developing eczema. BBzP is found in vinyl flooring, artificial leather, and other materials, which can slowly release it into indoor air.

The study included 407 nonsmoking African-American and Dominican women and their children living in New York City. A urine test during the third trimester of pregnancy assessed BBzP exposure.

The researchers found that onset of eczema by age 2 was 52 percent more likely in children whose mothers were exposed to higher concentrations of BBzP, compared to those whose mothers were exposed to lower concentrations. The African-American mothers were twice as likely as the Dominican-American mothers to report that their child was diagnosed with eczema. However, both groups showed a similar association between BBzP exposure and eczema. The researchers examined allergies as a possible mechanism, but found no evidence of a link between BBzP exposure and allergy.



*Citation:* Just AC, Whyatt RM, Perzanowski MS, Calafat AM, Perera FP, Goldstein IF, Chen Q, Rundle AG, and Miller RL. 2012. Prenatal exposure to butylbenzyl phthalate and early eczema in an urban cohort. *Environ Health Perspect*; doi:10.1289/ehp.1104544 [Online 26 June 2012].

(Nancy Lamontagne is a science writer with MDB, Inc., a contractor for the NIEHS Division of Extramural Research and Training, Superfund Research Program, and Worker Education and Training Program.)

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## Intramural papers of the month

*By Anshul Pandya, Sonika Patial, and Sheila Yong*

- [Agricultural Health Study examines fungal sensitization in farmers](#)
- [DNA polymerase zeta directly promotes somatic hypermutation in B lymphocytes](#)
- [SIRT1 regulates hepatic bile acid homeostasis](#)
- [NRF2 regulates retinoid X receptor alpha](#)

## Agricultural Health Study examines fungal sensitization in farmers

Scientists from NIEHS, the Centers for Disease Control and Prevention, and the National Cancer Institute have determined that farmers who grew tobacco, orchard fruit, or raised animals, particularly cattle, were more likely to be sensitized to fungi than farmers involved in other farming activities. The research was published in the *Journal of Allergy and Clinical Immunology*, and explored the associations between farming activities and fungal sensitization in farmers in the Agricultural Health Study.

Serum samples from 677 male subjects in the study were screened for fungal positivity by fluoroenzymeimmunoassay. These participants were pesticide applicators who had completed three questionnaires about their agricultural and medical history. The prevalence of fungal sensitization turned out to be approximately 4 percent, much lower than the general U.S. population. In addition to tobacco, orchard fruit, and cattle farmers being more fungal sensitized than other farmers, soybean, corn, and other grain farmers were also positively associated with fungal sensitization, although the association was not statistically significant. **(AP)**

*Citation:* Endres SM, Green BJ, Henneberger PK, Germolec DR, Bledsoe TA, Beezhold DH, London SJ, Alavanja MC, Beane Freeman LE, Hoppin JA. 2012. Fungal and atopic sensitization are low among farmers in the Agricultural Health Study. *J Allergy Clin Immunol* 130(1):267-270.

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# DNA polymerase zeta directly promotes somatic hypermutation in B lymphocytes

Researchers from NIEHS and the University of Louisville School of Medicine recently revealed a direct role for DNA polymerase zeta (Pol zeta) in facilitating somatic hypermutation (SHM) in B cells, a process critical in enhancing antibody affinity to a specific antigen.

The team used a pair of B cell-specific Pol zeta mutant mouse models consisting of a *Rev3* deletion, which deleted the catalytic domain of Pol zeta, and a Rev3L2610F knock-in mutation. Since other studies reported that a homologous substitution in yeast enhanced spontaneous ultraviolet-induced mutagenesis, the scientists hypothesized that this Pol zeta mutation would enhance SHM.

They found, that while both mutations did not alter B-cell development and germinal center formation in these mice, the *Rev3*-deleted B cells proliferated more slowly and were much less efficient in undergoing SHM upon antigenic stimulation, compared to Rev3L2610F B cells and wildtype controls. Furthermore, *Rev3*-deleted B cells suffered an activation defect, as proportions of GL7+ B cells were markedly reduced in both the spleen and Peyer's patch. Their findings suggest that the Rev3L2610F mutant of Pol zeta enhances SHM and subsequently increases the affinity-enhancing mutations of B cells toward specific antigens. These models are useful for understanding how the immune system fights pathogens with antigens that are constantly changing. (SY)

*Citation:* [Daly J, Bebenek K, Watt DL, Richter K, Jiang C, Zhao ML, Ray M, McGregor WG, Kunkel TA, Diaz M. 2012. Altered Ig hypermutation pattern and frequency in complementary mouse models of DNA polymerase zeta activity. J Immunol 188\(11\):5528-5537.](#)

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## SIRT1 regulates hepatic bile acid homeostasis

According to a recent study, deletion of the hepatic SIRT1 gene reduces the expression of a nuclear farnesoid X receptor (FXR), which regulates the homeostasis of bile acid. The report, published by researchers from NIEHS, the University of North Carolina at Chapel Hill, and the University of Illinois at Urbana-Champaign, provides a direct link between SIRT1 and cholesterol gallstone disease.

The SIRT1 gene encodes for mammalian sirtuin-1 protein, a NAD-dependent deacetylase, which plays a key role in linking nutrient signals to metabolic homeostasis in animals. Using quantitative polymerase chain reaction (qPCR) and the luciferase assay, the authors demonstrate that SIRT1 regulates the expression of FXR through hepatocyte nuclear factor 1alpha (HNF1alpha). In addition, they found that the liver cell-specific deletion of SIRT1 upset the normal functioning of bile acid metabolism and increased the probability of the development of cholesterol gallstones in mice on a lithogenic diet, one specially designed to increase the likelihood of stone formation.

These findings indicate that the SIRT1 gene plays an important role in regulating bile acid homeostasis in mammalian liver cells, through the HNF1alpha/FXR signaling pathway. By modulating the activity of SIRT1, scientists could develop novel therapies to prevent the formation of cholesterol gallstones and other metabolic diseases linked to type 2 diabetes. (AP)

*Citation:* Purushotham A, Xu Q, Lu J, Foley JF, Yan X, Kim DH, Kemper JK, Li X. 2012. Hepatic deletion of SIRT1 decreases hepatocyte nuclear factor 1 alpha/farnesoid X receptor signaling and induces formation of cholesterol gallstones in mice. *Mol Cell Biol* 32(7):1226-1236.

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## **NRF2 regulates retinoid X receptor alpha**

Researchers at NIEHS and The Hamner Institutes found a potential link between antioxidant responsive transcription factor NRF2 and retinoid X receptor alpha (RXRA) in human lymphocytes and adipocytes. This novel finding suggests that RXRA as a NRF2 responsive gene has potential implications in the cellular response to sulforaphane (SFN) treatment and lipid synthesis.

The aim of the study was to identify novel genes that are regulated by NRF2 in human cells. The researchers activated NRF2 with the dietary antioxidant, SFN, followed by chromatin-immunoprecipitation (ChIP) and high-throughput analysis, using techniques such as parallel sequencing, microarray technology, siRNA, and bioinformatics.

The results not only validated many known targets of NRF2 that are involved in processes, such as oxidant neutralization and xenobiotic metabolism, but also identified novel targets involved in pathways such as iron metabolism, cell death, immune response, and retinoid signaling by the nuclear receptor RXRA. RXRA is a binding partner for PparG, the master regulator of adipocyte differentiation, which has also been recently identified as a NRF2-regulated gene by NIEHS researchers. Furthermore, treatment of a preadipocyte cell line, 3T3-L1, with SFN led to the inhibition of differentiation into mature adipocytes, suggesting that NRF2-dependent perturbation of RXRA and PparG might be involved. (SP)

*Citation:* Chorley BN, Campbell MR, Wang X, Karaca M, Sambandan D, Bangura F, Xue P, Pi J, Kleeberger SR, Bell DA. 2012. Identification of novel NRF2-regulated genes by ChIP-Seq: influence on retinoid X receptor alpha. *Nucleic Acids Res*; doi:10.1093/nar/gks409 [Online 11 May 2012].

(Anshul Pandya, Ph.D., is an Intramural Research Training Award fellow in the NIEHS Laboratory of Neurobiology. Sonika Patial, D.V.M., Ph.D., and Sheila Yong, Ph.D., are visiting fellows in the NIEHS Laboratory of Signal Transduction.

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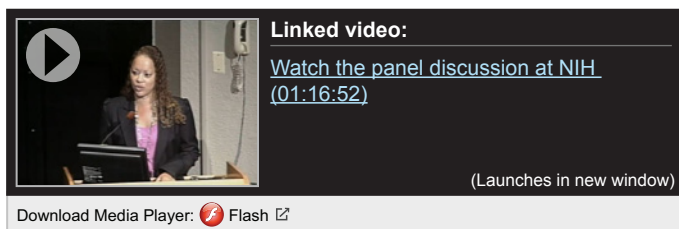


# Inside the Institute

## NIH celebrates LGBT Pride Month

By Eddy Ball

NIH observed Lesbian, Gay, Bisexual, and Transgender (LGBT) Pride Month June 29 with a panel discussion in Lipsett Auditorium on its Bethesda, Md., campus. Webcast to offsite employees at NIEHS and elsewhere, and archived online, the event commemorated the 43rd anniversary of the 1969 [Stonewall Uprising](#), which is widely recognized as the defining event that marked the beginning of the gay rights movement.



The panel was made up of five leading advocates of an inclusive social, educational, and occupational environment that actively promotes acceptance of LGBT individuals as members of a diverse workforce, and recognizes their healthcare challenges. LGBT healthcare issues, the panelists explained, range far beyond HIV/AIDS to include suicide, obesity, depression, other sexually transmitted diseases, smoking, high rates of teenage homelessness, and alcohol and other drug abuse.

The discussion, sponsored by the NIH Office of Equal Opportunity and Diversity Management (OEODM) and the LGBT group Salutaris, was introduced by [OEODM](#) Director Debra Chew and moderated by NIH Principal Deputy Director Lawrence Tabak, D.D.S., Ph.D.

The panel included Judith Bradford, Ph.D., director of the Center for Population Research in LGBT Health at [The Fenway Institute](#); [Ida Castro, J.D.](#), vice-president of Community Engagement and Equity at the Commonwealth Medical College; [Matthew Hoffman, Ph.D.](#), chief of the Matrix and Morphogenesis Section in the Laboratory of Cell and Developmental Biology at the National Institute of Dental and Craniofacial Research; [Mark Schuster, M.D., Ph.D.](#), chief of general pediatrics and vice chair for health policy in the Department of Medicine at Boston Children's Hospital; and Scout, Ph.D., director of the Network for LGBT Health Equity at The Fenway Institute.



*Chew delivered opening and closing remarks that emphasized OEODM's concern with equal opportunity for members of the LGBT community. (Photo courtesy of NIH)*



*Tabak reinforced the NIH commitment to inclusion, telling the audience, "We want to ensure that every person who wants to participate in biomedical research has access to NIH resources." (Photo courtesy of NIH)*

## Accomplishments in LGBT health, education, and work

It was clear from the beginning of the event that people concerned with LGBT inclusion are proud of what they and others have achieved. Tabak pointed to the 2012 [Pride Month Proclamation by President Obama](#); the update of the NIH harassment policy by NIH Director Francis Collins, M.D., Ph.D., to specifically include gender identity as a protected category; and the recent establishment of an LGBT Fellows and Friends group ([see text box](#)) with the help of the NIH Office of Intramural Training and Education (OITE) headed by Sharon Milgram, Ph.D.

Bradford and other panelists said they were encouraged by the 2011 Institute of Medicine [report](#) on LGBT health issues, as well as the experience of young people in Fenway's Summer Institute in LGBT Population Health, a model of mentoring for LGBT students and young investigators. In her presentation, Castro reported on several programs at hospitals to specifically address LGBT concerns about discrimination over such matters as same-sex partner visitation and to improve medical training about LGBT health issues.

"Things are dramatically better for me than they were 20 years ago," Schuster said of improvements in his workplace. Hoffman expressed his feeling of acceptance by his colleagues. "I've had very good experiences at NIH. ... I've always been out [here] and happy to talk about that."

### Issues remain

However, Castro countered that she was shocked to see what LGBT individuals experience in places that aren't as enlightened about orientation and identity as are Boston and Washington, D.C. "In the majority of this country, the reality is extremely hostile and extremely lonely," she explained. "There are so many [LGBT] individuals that have been truly left behind." Scout, who had been rejected by graduate programs because of gender identity, argued that scientists are still experiencing political and institutional harassment against overtly LGBT research, and facing ignorance about LGBT health issues.

NIH representatives also acknowledged how much remains to be accomplished. Tabak said, "We have a lot more to do to understand these complex issues, [and] we need more ideas to build a truly inclusive environment here at NIH." In her closing comments, Chew returned to the themes developed in the panel discussion and questions from the audience. "Diversity is critical to scientific innovation and public health," she concluded. "I do believe this is the civil rights issue of our generation."



*Scout listened as Hoffman underscored the benefits of promoting diversity in the workplace. "I think it's important [for us to appreciate] that each culture has something to offer," he said. (Photo courtesy of NIH)*



*Schuster, center, described the empowerment of acknowledging his orientation. "There's a sense for me of freedom," he explained. "When I went into fellowship out of residency, I was completely out, which meant I didn't need to hear any more gay jokes." Shown beside him are Bradford, left, and Castro. (Photo courtesy of NIH)*

## Resources for the LGBT community at NIH

- **Salutaris** — As the NIH LGBT employees forum, [Salutaris](#) distributes information about happenings ([Events](#)) and its role in promoting the Salutaris mission ([Equality](#)), friends in the community ([Networks](#)), and the LGBT community in the news ([News](#)). Employees from NIH and other federal agencies meet socially twice a month in the Washington, D.C., area for the Federal GLOBE (Gay, Lesbian, Bisexual, Transgender Employees) Networking Happy Hour and lunchtime Salutaris Meets and Eats.

Salutaris co-sponsors LGBT presentations and events, and helps promote NIH LGBT Pride Month celebrations through its listserv.

To join the Salutaris listserv and gain the most up-to-date news on Salutaris events, visit the [Join Us](#) website. For more information about Salutaris, visit the [Contact Us](#) website.

- **LGBT-Fellows and Friends** — As part of its diversity resources for NIH employees, OITE created LGBT-Fellows and Friends (LGBT-FF), to increase the visibility of the invisible minority. The group exists to help its members thrive in their professional and personal lives, by addressing issues unique to the LGBT community.

The LGBT-FF group organizes, throughout the year, various seminars to educate the general public on LGBT issues and issues of interest for LGBT individuals, as well as regular social and networking events to develop professional and personal networks.

LGBT-FF also aims to provide professional and personal mentoring and career enhancement for LGBT identified individuals. LGBT-FF is open to the entire NIH community, from postdocs to staff scientists, from graduate students to postbacs, from faculty to administrative staff, and from straight to LGBT identified individuals.

For more information about LGBT-FF, contact [Julien Senac](#) or [Christiane Kuschal](#). Join the [LGBT-FF listserv](#) to learn about up-coming LGBT-FF seminars, professional development activities, and networking opportunities.

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## Organizers call for upping Feds Feed Families goal

*By Eddy Ball*

The 2012 [Feds Feed Families \(FFF\)](#) campaign at NIEHS opened June 27, with a challenge from NIEHS/NTP Director Linda Birnbaum, Ph.D., to “Beat Your Best.” The drive is collecting non-perishable food and hygiene items, with the most wanted items including canned fruits, canned vegetables, multigrain cereal, grains, canned proteins, soups, 100 percent juice, condiments, snacks, baking goods, hygiene items, and paper products and household items.







“Last year, NIEHS employees generously donated more than 3,500 pounds,” Birnbaum wrote in an all-hands email message. “Given that the HHS goal is five pounds per person [this year], let’s see if NIEHS can do even more.” The first curbside collection of a record-setting 2,000 pounds was made July 25, and the second and final pickup will be Aug. 29 on the main campus and at Keystone. Drop boxes are also located throughout the buildings, for donations in between.

As it was last year, the Institute’s drive is organized and sponsored by NIEHS management, the American Federation of Government Employees (AFGE) 2923, and Blacks In Government (BIG), with the goal of collecting food and other items for delivery in July to the [Durham Rescue Mission](#) and in August to the [Food Bank of Central and Eastern North Carolina](#).

### Part of a national effort to fill food bank pantries

Nationally, this year marks the fourth annual Feds Feed Families drive, a federal government-wide effort organized by the U.S. Office of Personnel Management (OPM). The campaign has continued to grow each year since 2009 and, last year, the Capital Area Food Bank in Washington, D.C., received over 500,000 pounds of needed food.

At the kickoff event in June, OPM Director John Berry said organizers decided against setting a specific goal. Instead, the 2012 campaign challenged Capitol area federal employees to see for themselves by how much they could exceed last year’s record collection.

### Getting involved

Becoming a part of FFF is as easy as an email or phone call to the organizers — AFGE coordinator [Bill Jirles](#) at 919-541-2637, BIG coordinator [Annette Rice](#) at 919-541-4410, or NIEHS management coordinator [Monya Wells](#) at 919-541-1952.

Interested employees can also contact volunteers in their respective divisions and offices across NIEHS. If the level of donations is as great as organizers anticipate, FFF will need even more volunteers this year to handle drop box collections and the final curbside collection Aug. 29.



*Organizers gathered with some of the food and hygiene items from the first collection last year. Shown, left to right, are Wells, Rice, and Jirles. (Photo courtesy of Steve McCaw)*





*NIEHS Volunteers Paul Jung, M.D., chief of staff, and Brooke Rogerson, animal care and use coordinator in the Comparative Medicine Branch, welcomed donations at the main campus. (Photo by Eddy Ball)*



*Volunteers from the NIEHS Office of Acquisitions, Kim Holmes, left, and Jackie Osgood, worked the main entrance to Keystone. (Photo by Eddy Ball)*

## Most needed items for 2012 Feds Feed Families

FFF cannot accept any glass containers. The following kinds of items may be donated in paper, plastic, metal, or cloth containers, making sure products are well within their expiration dates:

- Canned meals, seafood, and meats
- Canned fruits and vegetables
- Cereal
- Peanut butter
- 100 percent juice
- Rice, pasta, and dried beans
- Infant products
- Hygiene items

During the drive, which runs from June 27 through Aug. 29, donations can be made at any of the drop boxes on campus.

### Building 101

B module – 1st floor elevator near the cafeteria

B module – 1st floor elevator near the front desk

C module – 1st floor next to the newspaper machine

C module – 1st floor elevator near the loading dock

D module – 1st floor near the loading dock

E module – 1st floor near the loading dock

F module – Near the ping pong table

F module – Near the peach tree

### CRU

Lobby area

### Building 102

Break room S152

### Keystone

1st floor near elevator

2nd floor near elevator

3rd floor near elevator

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# Student tour highlights summer internship opportunities

By Eddy Ball

College students involved in a summer program housed in the chemistry department at Duke University enjoyed something a little different during their [tour](#) of NIEHS July 17. Like previous visitors from schools and colleges, this year's group from Duke's [Research Experience for Undergraduates \(REU\)](#) program learned about the Institute's focus on environmental health, explored science career opportunities, and had a chance to see scientists at work during their half-day visit to NIEHS.

What made the 2012 tour stand out for many of the students was the final speaker on the program, Fiona Porkka —a member of last year's REU group who followed through on what she learned by applying to the Summer Intern Program (SIP) last winter. This summer, Porkka is spending a summer of scientific discovery in the Laboratory of Neurobiology working with a group headed by lead researcher Jerry Yakel, Ph.D.

Porkka talked about her experience so far this summer and answered questions about the application process, finding the right match for a summer mentor, and even such practical details as summer housing and the culture at NIEHS.

Organized by Special Assistant for Community Engagement and Outreach John Schelp, the lecture segment of the program included an overview of NIEHS and its leadership in advancing environmental health; a science talk by postdoctoral fellow [Michael Boyle, D.V.M.](#), of the NTP Cellular and Molecular Pathology Branch; a discussion of career paths from college to NIEHS by postdoctoral fellows [Tammy Collins, Ph.D.](#), of the Laboratory of Molecular Genetics, and [Michelle Heacock, Ph.D.](#), of the Laboratory of Structural Biology.

Following their tour of the facility, the students visited the lab of lead researcher [Thomas Kunkel, Ph.D.](#), chief of the Laboratory of Structural Biology. After a short talk about genome stability, Kunkel led the students in rotation at three microscopes where experiments were underway. Just before breaking for lunch and returning to Duke with their faculty mentor, [Stephen Craig, Ph.D.](#), the students heard from Porkka.

Funded by the National Science Foundation (NSF), REU is an 11-week residential program for undergraduates from schools throughout the country who are majoring in chemistry or a chemistry-related discipline. This is the second year that REU participants have toured the Institute as one of their field trips during their stay at Duke.



*Craig, center, joined his students for Kunkel's brief talk about genome stability. (Photo courtesy of Steve McCaw)*



*Kunkel explained the difference between RNA and DNA. Because it has oxygen, RNA is unstable and actually poses a threat to genome stability. (Photo courtesy of Steve McCaw)*





*Porkka, left, shared her excitement over her summer project, which involved exploring the potential for using a novel drug, phantasmadine, a nicotinic acetylcholine receptor agonist, in the treatment of neurological disorders. (Photo courtesy of Steve McCaw)*

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**NIEHS**  
National Institute of  
Environmental Health Sciences

*NIH...Turning Discovery Into Health*

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- Writer-Editor: [Eddy Ball](#)
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